FINAL REPORT of the AMC COMMITTEE-ARMAMENT

ANNEXES TO VOLUME 2

BOOK 1 of 2 BOOKS

VOLUME 3 of 4 VOLUMES
December 1974

DISCLAIMER

This report is the product of the Army Materiel Command Committee-Armament, an ad hoc committee formed by the Commander, US Army Materiel Command. It responds to a Department of the Army requirement to study the recommendation of the Army Materiel Acquisition Review Committee (AMARC) regarding establishment of an Armament Development Center. It presents alternative concepts, not detailed plans. It is advisory in nature and reflects neither official policy nor approved plans of the Department of the Army. The Secretary of the Army has directed that it be released to interested Members of Congress for their review and comment.

CHAPTER I

ANNEXES

CHAPTER I

ANNEXES

Table of Contents

ANNEX A

STUDY DIRECTIVE

ANNEX A

DEPARTMENT OF THE ARMY

HEADQUARTERS UNITED STATES ARMY MATERIEL COMMAND

5001 EISENHOWER AVE., ALEXANDRIA, VA. 22304

AMCPA-O

28 MAY 1974

SUBJECT: Study Directive - Concept Plan for Establishment of an Armament Development Center

Brigadier General Bennett L. Lewis
Special Assistant to Commander
US Army Materiel Command

1. Reference is made to the Army Materiel Acquisition Review Committee (AMARC) Report, dated 1 April 1974.

2. Purpose. Subject report recommended, among other things, that AMC establish an Armament Development Center. You are hereby designated as Chairman of an AMC Ad Hoc Committee to conduct a study to develop a concept plan for establishment of such a center.

3. Study Requirement. By 1 September 1974, develop a concept for the establishment of an Armament Development Center. This study will determine:

a. The general missions and functions of the Center.

b. The general operational and procedural concepts the Center would use. This will include consideration of the use of contractor support for mission accomplishment.

c. The general organization of the Development Center including personnel estimates to second level (directorate) only, as well as working arrangements, relationships and key interfaces between the Development Center and organizations internal and external to AMC, especially Armament Command.

d. Potential sites for the physical location of the Center to include a preliminary evaluation of each indicated site. (Estimated MCA and other costs, personnel implications and technical strong points/weaknesses, i.e., site conducive to innovative thinking, personnel recruitment potential, transportation availability.)

e. Physical organization closures, consolidations, reductions, and realignments which must be accomplished to establish subject Development Center including rationale and estimates of personnel and facilities to be impacted.

f. Estimate of total personnel and dollar costs and savings to effect implementation.

g. Milestone schedule in which to effect implementation, including the transfer and transition of on-going and new development efforts within the area of responsibility of the Armament Command.

4. Assumptions.

a. The study will assume the creation of an organizationally separate Development Center.

b. The Development Center will be responsible for the development and acquisition portion of the materiel life cycle until a system has been fielded. Once a system has been fielded the Center will continue to provide technical and TDP support to an appropriate systems command.

c. NICP and NMP functions for items developed will be the responsibility of the Armament Systems Command.

d. The Center will be self-sufficient in terms of procurement and technical expertise. However, comptroller, personnel, and other support-type activities may be furnished by a Systems Command or other AMC organization or it may be organized to be completely independent based on final site selection.

e. Project Managers will normally be assigned to the Development Center.

5. Study Members.

Full-time working group:

AMCCG - Brigadier General Bennett L. Lewis, Chairman

AMC Staff, ARMCOM, and others as determined by Chairman and Chief of Staff, AMC.

6. An Advisory/Consultation Group as indicated below will be available to support the study group effort:

CG, ARMCOM

Assistant Deputy for Laboratories

Director, AMSAA

Director, BRL

Management Consultant, Private Industry

Director, USA Missile RD&E Laboratory

7. Administration.

a. In-Process Reviews (IPRs) will be scheduled on or about 1 June, 1 July and 1 August. Final report (10 copies) is due to CG, AMC, 1 September 1974.

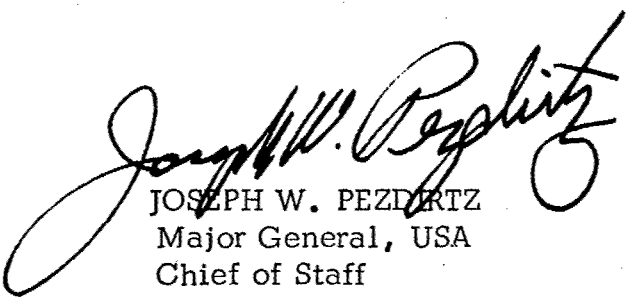
b. Care must be exercised to safeguard the "Close Hold" status of this study effort. Need-to-know will be kept to a minimum.

c. Administrative support will be arranged through HQ AMC SGS.

AMCPA-O
SUBJECT: Study Directive - Concept Plan for Establishment of an Armament Development Center

d. CG, ARMCOM will attend IPRs and study results will be coordinated with him before final submission.

FOR THE COMMANDER:



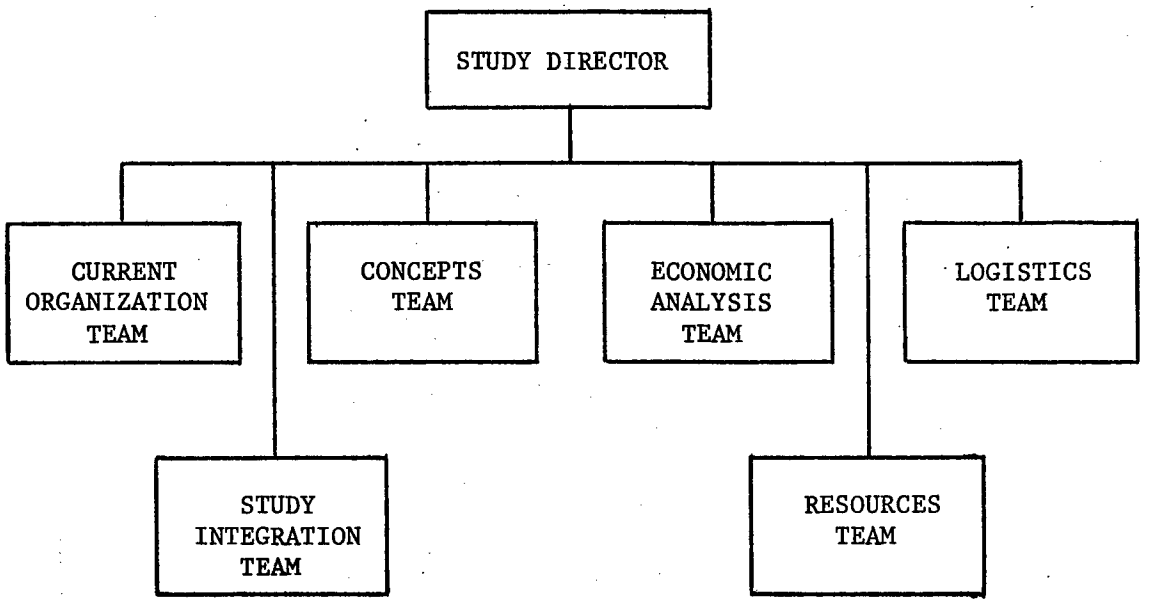
JOSEPH W. PEZDIRTZ
Major General, USA
Chief of Staff

CF:
CG, ARMCOM
AD/LAB
DIR, AMSAA
DIR, BRL
DIR, USA MSL RD&E LAB

ANNEX B

COMMITTEE ORGANIZATION

ANNEX B



COMMITTEE ORGANIZATION AND MEMBERSHIP

CHAIRMAN

BG Bennett L. Lewis

CHAIRMAN'S OFFICE STAFF

COL Lee T. Doyle, Deputy
Mr Bryant R. Dunetz, Spec Asst
CPT Michael L. Simonich
Mrs Nancy Laverty, Sec'y
Mrs Theresa Paddock, Sec'y
Mrs Fern G. Keebaugh, Admin
Mrs Chris Smith, Admin
Mrs Diane H. Tylee, Sec'y

CURRENT ORGANIZATION TEAM

COL Charles J. Treat, Chief
Mr David H. Gilbert
Mr Wallace Harris
Mr Alfred B. Wilkinson
Mr Walter H. Jewel
Mr James J. Confides
Mr Thad M. Pilewicz
Mr Ronald Seagrave
Mr Lawrence Libby
Miss Teresa Miller, Sec'y
Miss Chris Deaver, Sec'y

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COL James P. Duffy
Mrs Dorothy M. Troop, Editor/Admin Ofcr

RESOURCES TEAM 1/

COL Harvey L. Arnold, Chief
Mr Robert J. Fitz
Mr Gordon A. Sossich
Mrs Kathryn A. Carrico, Sec'y

ECONOMIC ANALYSIS TEAM

COL Vincent J. Klaus, Chief
Mr Charles E. Becker
Mr Blair H. Dodds
Mr William M. Ferron
Mr Alfred J. Gordon
Mr Larry A. Guerrero
MAJ Thomas W. Lott
Mr William H. Polchow

CONCEPTS TEAM

COL Alan A. Nord, Chief
Mr James A. Bender
Mr James Shirata
Mr Nelson R. Denton
COL James E. Wyatt
LTC James F. McCall
LTC Philip A. Pryor
Ms Jennifer W. Galleher, Sec'y
Mrs Elizabeth L. Schneider, Sec'y

1/ Later combined with Economic Analysis Team.
2/ Function later moved to Chairman's Office

ALC
TEAM MEMBERS &
MAJOR CONTRIBUTORS

COL C. K. Nichols, Chief
Mr C.B. Einstein, Dep Ch
Mr Arthur Nissen, Admin & Coord
Mr Dominic Delli Santi, Admin & Coord
Mr John Ackerman, Admin & Coord
Mrs Harriet Burns, Admin
Mrs Mary Horkulic, Editor
Mrs Marian Shack, Editor
Mr George Perkins, Evaluation Coord
Mr Harvey Lynn, Ch, Facilities Gp
Mr Roger Logan, Ch, Organization & Pers
Mr Richard Simmens, Organization & Pers
Mr Larry Flynn, Organization & Pers
Mr David Evans, Organization & Pers
Mr Richard Faille, Organization & Pers
Mr Richard Johnson, Ch, Cost & Economic Analysis
Mr Robert Maxey, Cost & Economic Analysis
Mr Leslie Griffin, Operational Interfaces
Mr J. Fanck, Dir, Materiel Management
Mr John Allcott, Dep Dir, Maintenance
Mr R. Milne, Dir RD&E
Mr Doug McCune, Dir Mgt Info
Mrs Isabelle Hansen, Dir Proc & Prod
Mr J. Obren, Dir, Quality Assurance

Mr Thomas Davis - Edgewood Arsenal
Mr Richard Barrett - Rock Island Arsenal
Mr John Salassa - Frankford Arsenal
Mr S. Fleischnik - Picatinny Arsenal
Mr Al Harding - Watervliet Arsenal

ANNEX I-A

(ARMCOM REG 10-1 - CHAPTER 3)
MISSION AND MAJOR FUNCTIONS

CHAPTER 3

MISSION AND MAJOR FUNCTIONS

3-1. MISSION. To exercise integrated commodity management (AR 10-11) of assigned materiel (para 3-3); to conduct or manage research with respect to assigned materiel and other research projects as assigned; to execute assigned missions in support of other AMC or Department of Defense (DOD) elements having centralized management responsibility for specific weapon systems or items; to direct and control assigned installations and activities.

3-2. MAJOR FUNCTIONS. a. Plan, direct, accomplish and supervise assigned materiel development programs and projects, including the integration of components into end item design.

b. Plan, direct, control, evaluate and execute research and technology in support of assigned mission.

c. Plan, direct, control, evaluate and execute long-range technical planning for assigned materiel in accordance with integrated logistics support (ILS) doctrine.

d. Plan, direct and accomplish the procurement and production, product engineering, production engineering, value engineering, human factors engineering, safety engineering and industrial readiness missions for assigned materiel.

e. Plan, direct and execute the standardization, technical data management, scientific and technical information and configuration management programs for assigned materiel.

f. Plan, direct, control, evaluate and execute a life-cycle, integrated product assurance program encompassing quality engineering, reliability and maintainability assessment, worldwide quality operations, test and evaluation and system performance assessment.

g. Plan, direct, supervise and execute integrated supply and stock control, cataloging, materiel utilization, preparation of technical and supply publications and disposal for assigned materiel consistent with national inventory control point (NICP) responsibilities.

h. Plan, direct, supervise and execute materiel maintenance engineering and management for the total life cycle of assigned materiel consistent with national maintenance point (NMP) responsibilities.

i. Plan, program, execute and supervise the worldwide maintenance and supply technical assistance program for assigned materiel.

j. Manage and perform international logistics operations related to assigned materiel.

k. Provide technical and administrative support to project managers, as required.

l. Plan, program, execute and supervise a logistic readiness liaison program with field commanders for assigned materiel.

m. Plan and conduct tests of assigned materiel.

n. Operate pilot production lines for newly developed materiel and assist industry in converting to quantity production of assigned materiel.

o. Conduct a foreign intelligence program.

p. Plan, supervise or conduct new equipment training and recommend new or revised related military occupational specialities (MOSs).

q. Provide training on a centralized basis for military materiel corrosion control.

r. Act as the CONUS Army Central Activity for the control, issue and disposal of assigned captured enemy equipment and other foreign materiel.

s. Compile and maintain serial number records of small arms: reported as sold, destroyed or stolen; issued to general officers.

t. Authorize and control the sale or donation of excess or surplus items to eligible organizations or governmental agencies.

u. Plan, direct and supervise military and civilian personnel management, manpower and training programs within the command.

v. Plan, direct and supervise the management information systems program and the data processing activities within the command.

w. Plan, direct and insure the application of sound transportation and traffic management principles and factors.

x. Provide interservice support related to assigned materiel; develop retail and wholesale supply and depot maintenance support agreements to provide or receive support from other services.

y. Provide for the maintenance, utilization, control, operation and security of the Alternate Files Repository and the AMC Technical Data Records Repository.

z. Provide photographic and audio-visual support services for defense agencies on an assigned area basis.

aa. Perform the following special functions:

(1) Operate the DOD Plastics Technical Evaluation Center with a responsibility to:

(a) Collect, exchange, collate, develop and evaluate technical data on plastic materials, adhesives and organic-matrix composites of interest to DOD.

(b) Distribute these data and evaluations to DOD activities, their designees and other organizations as appropriate.

(c) Render technical advice and assistance on plastics, adhesives and composites to DOD activities upon request and to other organizations as appropriate.

(2) Provide management for all radioactive test sample and calibration sources (except those uniquely associated with US Army Electronics Command tactical equipment); for radioactive training sources and for precise radioactive metrology sources.

(3) Operate the DA depository of technical data pertaining to nuclear components.

(4) As delegated by higher authority, coordinate in detail all armed services development programs for chemical weapons and defensive systems.

(5) Act as DA licensee for and control the supply, maintenance, storage, use and disposal of, assigned radioactive sources.

(6) Manage Army contracts with Continental United States (CONUS) land-burial facilities for disposal of radioactive waste and direct radioactive waste shipments to those facilities.

(7) Provide technical escort service for chemical, biological and etiological materiel, radioactive materials and other hazardous items when required by prescribed regulations or deemed by the shipper to be in the best interest of the Government.

(8) Develop, prepare and publish standardized escort procedures; develop, fabricate and procure special escort tools and equipment for DOD in coordination with the other services.

(9) Develop program guidance on medical research jointly with the Army Medical Service for defensive aspects of chemical weapons and implement and evaluate technical aspects of the program.

(10) Conduct liaison with Atomic Energy Commission (AEC) field agencies and Defense Nuclear Agency (DNA) field installations on the technical aspects of the engineering, production and field support of nuclear munitions.

(11) Conduct liaison with the US Army Training and Doctrine Command in developing and coordinating Required Operational Capability (ROC) documents and specific stockpile-to-target sequences for nuclear and chemical munitions. Coordinate draft nuclear warhead military characteristics received from the Field Command, DNA with Army field agencies.

(12) Distribute Operational Status Releases and Hold Orders received from the Commander, Field Command, DNA, for war reserve deployed to/at major Army commands.

(13) Provide the lead project officer for joint AEC-DOD (Army) project officer groups except SAFEGUARD.

(14) Provide an Army member on the Chemical/Biological Joint Technical Planning Group.

(15) Prepare, coordinate, publish and disseminate approved nuclear weapons logistics support plans for nuclear warhead sections, nuclear projectiles and atomic demolition munitions and logistic support plans for other assigned materiel as directed by the Deputy Chief of Staff for Logistics, DA.

(16) Issue suspension and restriction notices covering types and individual lots of non-nuclear and chemical munitions and recommend suspension or restriction of individual lots or types of nuclear munitions.

(17) Exercise technical supervision over the Munitions Stockpile Reliability Program.

(18) Operate for HQ, AMC the system of type designators ("XM" and "M") for development and adopted items of materiel.

(19) Provide LASER technology, physical science, engineering and other support in the conduct of research, exploratory development, related investigations and consultation on the biomedical effects of, and safety data/guidance on, LASER radiation as provided for in the AMC-USAMRDC (United States Army Medical Research and Development Command) Memorandum of Agreement establishing a Joint LASER Safety Team.

(20) Control the Biological Demilitarization Program (including funding and technical aspects).

(21) Plan and direct RDTE (Research, Development, Test and Evaluation: 6.2 - 6.7) and PEMA (Procurement of Equipment and Munitions, Army) for assigned Army fuze programs.

(22) Perform as the AMC Lead Laboratory for Energetic Materials Technology (Feltman Research Laboratory, Picatinny Arsenal).

(23) The AMC Explosive Ordnance Disposal (EOD) Program to include responsibility for the Army Technical Detachment at the Armed Forces Technology and Training Center and the Technical Escort Program.

3-3. ASSIGNED MATERIEL. a. Weapons and ammunition, nuclear and non-nuclear, including:

(1) Artillery weapons.

(2) Infantry weapons, crew-served weapons, mortars, recoilless rifles.

(3) Gun type air defense weapons.

(4) Surface vehicle mounted weapons.

(5) Aircraft mounted weapons for conventional and remotely piloted aircraft.

(6) Infantry and conventional artillery launching devices for recoilless, conventional round and high capacity boosted rocket artillery round, excluding free rocket and guided, ballistic and target missile related launching and ground support equipment.

b. Weapon systems and support equipment, including: vehicle mounted weapon systems, self-propelled artillery systems, gun air defense systems and assigned special purpose vehicles.

c. Turrets/cupolas and mounts required for weapon installation and operation, including stabilizing, elevating and traversing mechanisms.

d. Fire control equipment (excluding that integral to missile systems and missile air defense fire coordination systems).

e. Rocket and missile warhead sections.

f. Demolition munitions, mines, bombs, grenades, pyrotechnics, boosters, gas generators and jet-assisted takeoff.

g. Offensive and defensive chemical materiel, flame and incendiary systems and defensive biological and radiological materiel as assigned.

h. Propellant-actuated devices.

i. Clips, links, magazine fillers and linker-delinkers for conventional ammunition.

j. Related components, containers, handling and ancillary equipment.

k. Basic issue items (BII) for assigned materiel.

l. Training equipment, devices and simulators relating to assigned materiel (with support furnished by US Army Training Devices Agency, Naval Equipment Center).

m. Special tools, test, measurement and diagnostic equipment which are a part of or used with, assigned materiel (including special inspection and test equipment and table of organization and equipment (TOE) special test equipment.

n. Tools and maintenance equipment specified for use with equipment managed by two or more AMC Commodity Commands: common tools, common (general purpose) tool sets; common (general purpose) maintenance shop sets; and common test, measurement and diagnostic equipment. For the common tools and tool sets assigned to Defense Supply Agency/General Services Administration (DSA/GSA) for integrated management, this responsibility is limited to technical decision authority on sets and set configurations. Army materiel management responsibilities enunciated in AR 710-1 continue as responsibility of the Army Class Manager Activity (ACMA) for general supplies, US Army General Materiel and Parts Center, New Cumberland Army Depot, PA.

ANNEX I-B

INSTALLATIONS VISITED BY CURRENT
ORGANIZATION TEAM

ANNEX I-B

INSTALLATIONS VISITED BY
CURRENT ORGANIZATION TEAM

Rock Island Arsenal	10 June 74
Watervliet Arsenal	12 June 74
Picatinny Arsenal	13-14 June 74
Frankford Arsenal	17 June 74
Ballistic Research Laboratories	18 June 74
Edgewood Arsenal	19 June 74
Harry Diamond Laboratories	20 June 74
HQ ARMCOM, Maintenance Dir. Plans & Analysis, Material Mgt.	26 June 74 27 June 74
ARMCOM, (Team Representation)	28 June 74
Rock Island Arsenal Installation Dir.	12 July 74
ARMCOM (Maintenance Dir)	12 July 74
Headquarters ARMCOM - Plant Operation Armament Systems, Mfg Technology Transportation & Traffic Mgt, Plans & Analysis, Procurement & Production and RDT&E	15-16 July 74
Rodman Laboratories	17 July 74
US Air Force Log Cmd; Wright Patterson AFB	18 July 74
AMETA	22-24 July 74
ARMCOM (Maintenance Dir)	23-25 July 74
Lone Star Army Ammunition Plant	6 August 74
Pine Bluff Arsenal	7-8 August 74
Twin Cities AAP	30 September 74
Honeywell Corporation	1 October 74

Figure I-B-1

Milan AAP	2-3 October 74
Holston AAP	21 October 74
Radford AAP	22-23 October 74
Chamberlain Corporation	30 October 74
Scranton AAP	11-12 November 74

Figure I-B-2

ANNEX I-C1

VEHICLE TYPE MISSION RESPONSIBILITIES

VEHICLE TYPE MISSION RESPONSIBILITIES

The attached figure shows Vehicle Type Mission Responsibilities and reflects the principal breakout of subsystems and the major subordinate command and arsenal(s) assigned the technical materiel support responsibility.

The figure is an excellent example of the fragmentation of missions on types of vehicles. For example, ARMCOM's responsibility for technical support of an artillery weapon involves all five of its arsenals, plus BRL, HDL. All of these installations are scattered in the eastern half of the United States.

TECHNICAL AND MATERIEL SUPPORT RESPONSIBILITY

Vehicle Type Mission Responsibility	AMMO	Mounts	Fire Ctrl	Chemical Agt Alarm	Filters	Masks	Dispensing/ Dispersing	Flame Thrower	Protection Equipment	Guns/ Cannons	Turrets Cupolas	Smoke Generators	Vehicle Chasis
Tactical Surface TACOM	ARMCOM PA FA EA	ARMCOM RI	ARMCOM FA	ARMCOM EA	ARMCOM EA	ARMCOM EA	ARMCOM EA PA	ARMCOM EA	ARMCOM EA	ARMCOM RI WVLT			
Tanks TACOM	ARMCOM PA FA EA	ARMCOM RI	ARMCOM FA		ARMCOM EA	ARMCOM EA				ARMCOM RI WVLT	ARMCOM RI		
Aircraft AVSCOM	ARMCOM PA EA FA	ARMCOM RI	ARMCOM FA				ARMCOM PA EA			ARMCOM RI		ARMCOM EA	
Carriers, Personnel, Cargo Missile etc Scout TACOM	ARMCOM PA FA EA	ARMCOM RI	ARMCOM FA	ARMCOM EA	ARMCOM EA	ARMCOM EA		ARMCOM EA	ARMCOM EA	ARMCOM RI			
Self-Propelled Artillery ARMCOM	ARMCOM PA FA EA	ARMCOM RI	ARMCOM FA	ARMCOM EA	ARMCOM	ARMCOM			ARMCOM EA	ARMCOM RI WVLT	ARMCOM RI	ARMCOM EA	TACOM
Special purpose Vehicles													
a. Mobility TACOM													TACOM
b. Firepower ARMCOM	ARMCOM PA FA EA									ARMCOM RI WVLT			
c. Combat Supt Decon Flame service ARMCOM									ARMCOM EA				TACOM
d. CB POD M51 ARMCOM													TACOM
e. Battery Cmd MICOM									ARMCOM EA				
f. Controls TACOM									ARMCOM EA				

Figure I-C1-1

ANNEX I-C2

SMALL MUNITIONS MISSION RESPONSIBILITIES

SMALL MUNITIONS MISSION RESPONSIBILITIES

The attached figure shows the principal subsystem breakout of small munition items, or munition related items, and the major subordinate command and arsenal(s) assigned the task of Technical Materiel Support responsibility. There are a number of items for which there are no component breakouts. The responsible installations for these items are shown under "Basic Units."

There are six of the small munition systems shown which for all practical purposes require no technical and materiel support other than that available in-house. The remaining small systems, as in the case of large systems, require the effort of other installations and in some cases, all five arsenals.

TECHNICAL AND MATERIEL SUPPORT RESPONSIBILITY

Small Munitions Systems	Basic Unit	Weapon	Ammo	Dispensers Dispersers	Fire Control
Grenades, Chemical			ARMCOM EA PA		
Demolition	ARMCOM PA				
Document, File & Crypto Destroyers	ARMCOM EA				
Flame Thrower	ARMCOM EA				
Protective Mask, Chem Detection & Alarm Decon Kits	ARMCOM EA				
Protection & Treatment sets	ARMCOM EA Med Corps				
Scopes & Binoculars Optical Rifle Sights	ARMCOM FA				
CAD/PAD	ARMCOM FA				
Shoulder, hand & ground fired Small Arms		ARMCOM RI	ARMCOM FA PA* EA		ARMCOM FA
Mortars		ARMCOM WVLT	ARMCOM PA HDL FA EA		ARMCOM FA
Recoilless Rifles		ARMCOM WVLT	ARMCOM PA FA		ARMCOM FA
Grenades, Explosive			ARMCOM PA EA		
Mines			ARMCOM PA HDL EA	ARMCOM PA* EA	
Shoulder Fired Rockets		ARMCOM PA EA	ARMCOM PA EA		
Warheads, Missile			ARMCOM PA EA HDL		

Figure I-C2-1

* PMSA

ANNEX I-C3

LIFE CYCLE TECHNICAL RESPONSIBILITIES AND FUNCTIONS

LIFE CYCLE TECHNICAL RESPONSIBILITIES AND FUNCTIONS

The two attached figures show the life cycle technical responsibilities and functions of a typical end item for each, Rock Island Arsenal and Picatinny Arsenal. The items chosen are the Towed Howitzer M102 and Cartridge HEAT 105mm, respectively.

Points of interest in the figures are:

a. Rock Island -

(1) 529 functions involved in the 29 item/components; 342 involve no significant other agency support (65%).

(2) Watervliet Arsenal and Frankford Arsenal provide 7% technical support.

(3) Frankford Arsenal provides an additional 19% technical support primarily in the fire control area.

(4) The remaining 9% involves a combination of Rock Island, ARMCOM, Watervliet, Frankford and TECOM.

b. Picatinny Arsenal -

(1) 432 functions involved in the 33 item/components; 254 include no significant other agency support (59%).

(2) Frankford Arsenal provided the primary support in an additional 157 functions (36%).

(3) The remaining agencies involved are TECOM, BRL, AMSAA and GOCO Plants (5%).

LIFE CYCLE T
HO

FUNCTION ITEM/COMPONENT	RESEARCH	EXPLORATORY/ ADVANCED DEVELOPMENT	NEW PROCESS CONCEPTS/ PROCESS FEASIBILITY (MFG:)	ENGINEERING DEVELOPMENT (INCL PEP)	PREPRODUCTION ENGINEERING	TECH DATA PACKAGE PREPARATION & MAINTENANCE	ENGINEERING IN DIRECT SUPPORT OF PRODUCTION	MAINTENANCE ENGINEERING RIA	PRODUCT IMPROVEMENT	PROCESS IMPROVEMENT	SYSTEMS, COST/EFFECTIVENESS, DECISION RISK VULNERABILITY & THREAT ANALYSIS
COMPLETE M102	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(6)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA
M37A1 RECOIL MECHANISM	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
RECOIL CYLINDER ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1) *	(6)RIA	(1)	(1)	(1)
RECUPERATER CYLINDER ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
YOKES	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
RAILS	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
M31 CARRIAGE	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
ACTUATOR GEAR & HOUSING ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
ELEVATING MECHANISM	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
TRAVERSING MECHANISM	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
BALL SCREW & EQUILIBRATOR ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
BOX TRAIL ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
FIXING PLATFORM ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
CRADLE ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
BUFFER ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
CONTROL ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
GEAR BOX ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
BRAKE & SPINDLE ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA	(1)	(1)	(1)
WHEEL SUPPORT ASSY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(6)RIA RIA	(1)	(1)	(1)
BASIC ISSUE ITEMS	(3)WVLT-FA	(3)WVLT-FA	(3)WVLT-FA	(3)WVLT-FA	(3)WVLT-FA	(3)WVLT-FA	(3)WVLT-FA	(6)WVLT-FA	(3)WVLT-FA	(3)WVLT-FA	(3)WVLT-FA
M137A1 CANNON	(4)WVLT	(4)WVLT	(4)WVLT	(4)WVLT	(4)WVLT	(4)WVLT	(4)WVLT	(6)WVLG	(4)WVLT	(4)WVLT	(4)WVLT
M14 QUADRANT, FIRE CONTROL	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(6)FA	(4)FA	(4)FA	(4)FA
M13 PANORAMIC TELESCOPE	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(6)FA	(4)FA	(4)FA	(4)FA
M8 CANT CORRECTOR	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(6)FA	(4)FA	(4)FA	(4)FA
M14 TELESCOPE ELBOW	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(6)FA	(4)FA	(4)FA	(4)FA
M34 MOUNT TELESCOPE	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(6)FA	(4)FA	(4)FA	(4)FA
DESCRIPTION OF MANUFACTURE											
MANUALS											
TEST & INSPECTION EQUIPMENT											

Figu

I-C3-39

ROCK ISLAND ARSENAL
CYCLE TECHNICAL RESPONSIBILITIES/FUNCTIONS
HOWITZER, LIGHT, TOWED, M102

NESS, & S	TECHNICAL ASSISTANCE TO USER	ENGINEERING DOCUMENTATION OTHER THAN TDP	PROTOTYPE FABRICATION	MAJOR ITEM PRODUCTION	PRODUCTION SUPPORT TO NICP	MALFUNCTION INVESTIGATION	PRODUCT ASSURANCE	DT I TYPE TESTING	DT II & DT III TYPE TESTING	VALUE ENGINEERING	STANDARDIZATION	CATALOGING	NEW EQUIPMENT TRAINING	MOBILIZATION ACTIVITIES
	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(4)WVLT-FA	(2)TECOM	(5)	(4)WVLT-FA	(4)WVLT-FA	RIA (6)WVLT-FA	(4) WVLT-FA	(4) WVLT-FA
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(1)	(1)	(1)	(1)	(1)	(1)	(1)			(1)	(1)			
	(5)WVLT-FA	(5)WVLT-FA	(5)WVLT-FA	(5)WVLT-FA	(5)WVLT-FA	(5)WVLT-FA	(5)WVLT-FA			(5)WVLT-FA	(5)WVLT-FA			
	(4)WVLT	(4)WVLT	(4)WVLT	(4)WVLT	(4)WVLT	(4)WVLT	(4)WVLT			(4)WVLT	(4)WVLT			
	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA			(4)FA	(4)FA			
	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA			(4)FA	(4)FA			
	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA			(4)FA	(4)FA			
	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA			(4)FA	(4)FA			
	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA	(4)FA			(4)FA	(4)FA			
	RIA (6)WVLT-FA	(4)WVLT-FA RIA (6)WVLT-FA												
							(5)WVLT-FA							

FUNCTIONAL RESPONSIBILITIES ARE INDICATED AS FOLLOWS:

1) Primary responsibility of Rock Island Arsenal, with no significant support by other agencies.
2) Primary responsibility of Rock Island Arsenal, with testing support provided by other agency/agencies.*
3) Primary responsibility of Rock Island Arsenal, with some engineering support provided by other agency/agencies.*
4) Systems engineering responsibility of Rock Island Arsenal, with engineering support provided by other agency/agencies.*
5) Primary responsibility of TECOM.
6) Primary responsibility of ARMCOM with engineering support provided by other agency/agencies.*

*Support agencies are indicated on the chart in appropriate blocks.

RIA - Rock Island Arsenal
FA - Frankford Arsenal
WVLT - Watervliet Arsenal

gure I-C3-1

PICATI
LIFE CYCLE TECHNICA
TYPICAL 105

FUNCTION / ITEM/CONTENT	RESEARCH	EXPLORATORY/ ADVANCED DEVELOPMENT	NEW PROCESS CONCEPTS/ PROCESS FEASIBILITY (OPNS IAP)	ENGINEERING DEVELOPMENT (INCL PEP)	PREPRODUCTION ENGINEERING	TECH DATA PACKAGE PREPARATION & MAINTENANCE	ENGINEERING IN DIRECT SUPPORT OF PRODUCTION	MAINTENANCE ENGINEERING	PRODUCT IMPROVEMENT	PROCESS IMPROVEMENT	SYSTEMS, COST/EFFECTIVENESS, DECISION RISK VULNERABILITY & THREAT ANALYSIS
COMPLETE RD	(1)	(2) TECOM	(1)	(2) TECOM	(1)	(1)	(2) TECOM	(1)	(2) TECOM	(1)	(3) BRL, AMSAA
PROJECTILE BODY	(3) FA	(3) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(3) FA	(6) FA	(6) FA	(6) FA
BOOM	(3) FA	(3) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(3) FA	(6) FA	(6) FA	(6) FA
FIN	(3) FA	(3) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(3) FA	(6) FA	(6) FA	(6) FA
OBTURATOR	(3) FA	(3) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(3) FA	(6) FA	(6) FA	(6) FA
SHAPED CHARGE LINER	(3) FA	(3) FA	(3) FA	(3) FA	(6) FA	(6) FA	(3) FA	(3) FA	(3) FA	(3) FA	(3) FA
STUDS	(3) FA	(3) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(3) FA	(6) FA	(6) FA	(6) FA
PIEZOELECTRIC POWER SUPPLY	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3) BRL
IMPACT SWITCH	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3) BRL
FUZE CABLE		(1)		(1)	(1)	(1)	(1)	(1)	(1)		(1)
CONDUIT		(1)		(1)	(1)	(1)	(1)	(1)	(1)		
FIRE FUZE BODY		(1)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
DETONATOR	(1)	(1)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
LEAD	(1)	(1)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
BOOSTER PELLET	(1)	(1)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
FUZE LOCK PINS		(1)		(1)	(1)	(1)	(1)	(1)	(1)		
SHOCK PAD		(1)		(1)	(1)	(1)	(1)	(1)	(1)		
HE CHARGE	(1)	(1)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3) BRL
EXPLOSIVE MATERIALS	(1)	(1)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
TRACER ASSEMBLY		(6) FA		(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA
TRACER BODY		(6) FA		(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	
TRACER CHARGE		(6) FA		(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	
PLUG & DISC ASSEMBLY		(6) FA		(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA		
ELECTRIC PRIMER	(1)	(1)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3) BRL
CARTRIDGE CASE		(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA	(6) FA
PROPELLANT	(1)	(1)	(3) GOCO PLANTS	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3) BRL
WEAR REDUCING ADDITIVE	(1)	(1)		(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3) BRL
PACKING BOX		(1)		(1)	(1)	(1)	(1)	(1)	(1)		(1)
FIBER CONTAINER		(1)		(1)	(1)	(1)	(1)	(1)	(1)		(1)
DESCRIPTION OF MANUFACTURE											
MANUALS											
TEST & INSPECTION EQUIPMENT											
ROD BENDER SAFE PROCEDURES											

THE FOLLOWING ARE NOT APPLICABLE TO THIS ITEM:

- PLANT FACILITIZATION
- PILOT PLANT DESIGN/DEVELOPMENT
- POLLUTION ABATEMENT
- HANDLING EQUIPMENT

Figure

I-

I-CB-4a

NY ARSENAL
RESPONSIBILITIES /FUNCTIONS
M HEAT CARTRIDGE

TECHNICAL ASSISTANCE TO USER	ENGINEERING DOCUMENTATION OTHER THAN TDP	PROTOTYPE FABRICATION	MALFUNCTION INVESTIGATION	PRODUCT ASSURANCE	DT I TYPE TESTING	DT II & DT III TYPE TESTING	VALUE ENGINEERING	STANDARDIZATION	CATALOGING	NEW EQUIPMENT TRAINING	MOBILIZATION ACTIVITIES	DEMILITARIZATION ACTIVITIES
(1)	(1)	(1)	(2) TECOM	(1)	(1)	(5)	(1)	(1)	(1)	(1)	(1)	(1)
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(1)	(1)	(1)				(1)	(1)				
	(2)	(1)	(1)				(1)	(1)				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(1)	(1)	(1)				(1)	(1)				
	(4) FA	(4) FA	(4) FA				(4) FA	(4) FA				
	(1)	(1)					(1)	(1)				
	(1)	(1)					(1)	(1)				
	(1)	(1)					(1)	(1)				
	(1)	(1					(1)	(1)				
	(1)											
(1)	(1)											
				(1)								
(1)	(1)											

I-C3-2

C3-4

FUNCTIONAL RESPONSIBILITIES ARE INDICATED AS FOLLOWS:

1. PRIMARY RESPONSIBILITY OF PICATINNY ARSENAL WITH NO SIGNIFICANT SUPPORT BY OTHER AGENCIES
2. PRIMARY RESPONSIBILITY OF PICATINNY ARSENAL WITH TESTING SUPPORT PROVIDED BY OTHER AGENCY/AGENCIES.*
3. PRIMARY RESPONSIBILITY OF PICATINNY ARSENAL WITH SOME ENGINEERING SUPPORT PROVIDED BY OTHER AGENCY/AGENCIES.*
4. CONFIGURATION/SYSTEMS ENGINEERING RESPONSIBILITY OF PICATINNY ARSENAL, WITH ENGINEERING SUPPORT PROVIDED BY OTHER AGENCY/AGENCIES.*
5. PRIMARY RESPONSIBILITY OF TECOM.

*PRIMARY SUPPORT AGENCIES ARE INDICATED ON THE CHART IN APPROPRIATE BLOCKS

ANNEX I-D1

PERSONNEL DISTRIBUTION - CURRENT ARMAMENT COMMUNITY

Personnel Distribution
Current Armament Community

	HQ ARMCOM			ROCK ISLAND			PICATINNY			WATERVLIET			FRANKFORD			BRL			EDGEWOOD			GRAND		TOTAL
MISSION	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOTAL
Small Cal Lab																								
RDTE Dir	11		11																			11		11
Rodman Lab				256	20	276																256	20	276
Pittman Dunn Lab													127	8	135							127	8	135
Fire Control Dev													105	30	135							105	30	135
Munitions Dev													145	78	223							145	78	223
Sub-Total	11		11	256	20	276							377	116	493							644	136	780
Large Cal Lab																								
RDTE Dir	11		11																			11		11
Rodman Lab				224	21	245																224	21	245
Feltman Lab							309	29	338													309	29	338
Ammo Dev Dir							1015	70	1085													1015	70	1085
Mun Spt Dir							48	16	64													48	16	64
NUC Dev Dir							443	76	519													443	76	519
Benet Lab										341		341										341		341
Pittman-Dunn Lab													40	7	47							40	7	47
Fire Control Dev													101	25	126							101	25	126
Munitions Dev													44	30	74							44	30	74
Sub-Total	11		11	224	21	245	1815	191	2006	341		341	185	62	247							2576	274	2850
Ballistics Lab																								
BRL																618		618				618		618
Sub-Total																618		618				618		618
Chemical Lab																								
Chem Lab																			215		215	215		215
Biological Lab																			312		312	312		312
Development Eng																			388	79	467	388	79	467
Sub-Total																			915	79	994	915	79	994
Laboratory Sub-Total	22		22	480	41	521	1815	191	2006	341		341	562	178	740	618		618	915	79	994	4753	489	5242
OTHER MISSION																								
Command & Control																								
Off CDR/Dir	17		17		9	9	13	5	18		4	4	12	11	23	7		7	18		18	67	29	96
RDTE Dir	94	44	138																			94	44	138
Arm Sys Off		92	92																				92	92
Comodity Mgmt				2	25	27																2	25	27
Rodman Lab				24		24																24		24
Materials App																7		7				7		7
Special Staff																12		12				12		12
Demil Office																			5		5	5		5
Sub-Total	111	136	247	26	34	60	13	5	18		4	4	12	11	23	26		26	23		23	211	190	401

FIGURE 1-D1-1

Personnel Distribution
Current Armament Community

	HQ ARMCOM			ROCK ISLAND			PICATINNY			WATERVLIET			FRANKFORD			BRL			EDGEWOOD			GRAND		TOTAL
	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOTAL
Plans & Analysis																								
Plans & Anal Off	10	33	43				32		32				20	10	30				23	4	27	85	47	132
Sys Anal Off	30	29	59																			30	29	59
Rodman Lab				35		35																35		35
Benet Lab										19		19										19		19
Concepts Anal																78		78				78		78
Opns Research																5		5				5		5
Sub-Total	40	62	102	35		35	32		32	19		19	20	10	30	83		83	23	4	27	252	76	328
Project Manager																								
CAWS	47		47																			47		47
VRFWS	36		36																			36		36
SA	54		54																			54		54
SAFE		26	26																				26	26
OEMIL		62	62																				62	62
Sub-Total	137	88	225																			137	88	225
Mfg Tech																								
Mfg Tech							146	29	175				28	127	155				267	44	311	441	200	641
Benet Labs										35		35										35		35
Sub-Total							146	29	175	35		35	28	127	155				267	44	311	476	200	676
Foreign Intel																								
RDTE Dir		10	10																				10	10
Fgn Intel Off							5		5				4		4	4		4	3		3	15		15
Sub-Total		10	10				5		5				4		4	4		4	3		3	16		26
OTH MIS Sub-Total	288	296	584	61	34	95	196	34	230	54	4	58	64	148	212	113		113	316	48	364	1092	564	1656
MISSION Sub-Total	310	296	606	541	75	616	2011	225	2236	395	4	399	626	326	952	731		731	1231	127	1358	5845	1053	6898
TECHNICAL SUPPORT																								
Tech Spt Dir							374	14	388				274	51	325				179	16	195	827	81	908
Rodman Lab				124		124																124		124
Scty & Svcs																26		26				26		26
Sub-Total				124		124	374	14	388				274	51	325	26		26	179	16	195	977	81	1058
Industrial Opns																								
Plant Opns Dir		24	24																				24	24
Indust Opns Dir				24	1342	1366	730	120	850	124	1458	1582	234	371	605							1112	3291	4403
Mfg Tech Dir																			50		50	50		50
Sub-Total		24	24	24	1342	1366	730	120	850	124	1458	1582	234	371	605				50		50	1162	3315	4477
TECH SUPPORT Sub-Tot		24	24	148	1342	1490	1104	134	1238	124	1458	1582	508	422	930	26		26	299	16	245	2139	3396	5535
Admin Support																								
Legal		19	29				19	1	20	2	6	8	7	10	17				6	3	9	34	49	83
Comptroller	118	301	419	9	107	116	138	35	173	8	86	94	79	57	136				122	8	130	474	594	1068
SAFETY																								
Safety Off		23	23	1	8	9	20	2	22	1	4	5	6	1	7	5		5	18		18	51	38	89
Health Phy																5		5				5		5
Safety Sub-Total		23	23	1	8	9	20	2	22	1	4	5	6	1	7	10		10	18		18	56	38	94
Civilian Pers				8	85	93	68	12	80	4	31	35	29	24	53							109	152	261

FIGURE I-D1-1 CONT'D (2)

	HQ ARMCOM			ROCK ISLAND			PICATINNY			WATERVLIET			FRANKFORD			BRL			EDGEWOOD			GRAND		TOTAL
	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOTAL
Management Info																								
Mgt Info Dir	39	402	441				176	10	186	3	38	41	58	46	104				76		76	352	496	848
Scty & Svcs																49		49				49		49
Sub-Total	39	402	441				176	10	186	3	38	41	58	46	104	49		49	76		76	401	496	897
Force Development																								
Force Dev Dir	48	49	97	1	11	12	22	4	26	1	3	4	9	7	16				11		11	92	74	166
Force Dev & Bud																20		20				20		20
Sub-Total	48	49	97	1	11	12	22	4	26	1	3	4	9	7	16	20		20	11		11	112	74	186
Other Admin Spt																								
Gen Staff	40	59	17																			40	59	17
Spl Staff			82																					82
Admin Svcs				8	144	152																8	144	152
Admin Other										10	48	58										10	48	58
HQ Det & Other							16	16															16	16
Admin Staff													58	49	107				39		39	97	49	146
Scty & Svcs																26		26				26		26
Adjutant																			31		31	31		31
Sub-Total	40	59	99	8	144	152		16	16	10	48	58	58	49	107	26		26	70		70	212	316	528
Admin Sub-Total	245	863	1108	27	355	382	443	80	523	29	216	245	246	194	440	105		105	303	11	314	1398	1719	3117
Quality Assur & Proc																								
Quality Assur																								
Product Assur Dir	65	167	232	1	118	119	437	13	450	24	134	158	110	104	214				116	28	144	753	564	1317
Rodman Lab				66		66																66		66
Sub-Total	65	167	232	67	118	185	437	13	450	24	134	158	110	104	214				116	28	144	819	564	1383
Procurement	30	690	720	4	44	48	105	57	162	11	93	104	135	132	267				56	55	111	341	1071	1412
QA & Proc Sub-Total	95	857	952	71	162	233	542	70	612	35	227	262	245	236	481				172	83	255	1160	1635	2795
Miss & Spt Sub-Tot	650	2040	2690	787	1934	2721	4100	509	4609	583	1905	2488	1625	1178	2803	862		862	1935	237	2172	10542	7803	18345
Base Support																								
Security																								
Security				6	73	79	80	15	95	3	28	31	38	28	66							127	144	271
Scty & Svcs																5		5				5		5
Sub-Total				6	73	79	80	15	95	3	28	31	38	28	66	5		5				132	144	276
Base Support																								
Instl Spt	81	22	103																			81	22	103
Log Spt				17	552	569	691	143	834													708	695	1403
Traffic Mgt		44	44	2	24	26				4	35	39										6	103	109
Facilities Eng				26	277	303				17	179	196										43	456	499
Instl Svcs													240	204	444							240	204	444
Scty & Svcs																25		25				25		25
Sub-Total	81	66	147	45	853	898	691	143	834	21	214	235	240	204	444	25		25				1103	1480	2583
Base Spt Sub-Total	81	66	147	51	926	977	771	158	929	24	242	266	278	232	510	30		30				1235	1624	2859
Total ADC Base	731	2106	2837	838	2860	3698	4871	667	5538	607	2147	2754	1903	1410	3313	892		892	1935	237	2172	11777	9427	21204
Logistic Base																								
Maint Mgmt		438	438																				438	438
Matl Mgmt		716	716																				716	716
Fire Cont Maint														131	131								131	131
Tech Escort																				184	184		184	184
Sub-Total		1154	1154											131	131					184	184		1469	1469

FIGURE 1-D1-1, CONTINUED (3)

Personnel Distribution
Current Armament Community

	HQ ARMCOM			ROCK ISLAND			PICATINNY			WATERVLIET			FRANKFORD			BRL			EDGEWOOD			GRAND		TOTAL
	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOT	DC	LC	TOTAL
Armaments Base	731	3260	3991	8382860		3698	4871	667	5538	607	2147	2754	1903	1541	3444	892		892	1935	421	2356	11777	10896	22673
Special Mission																								
Plastec (Feltman Lab)								10																10
PAD/CAD (Frankford)																								
Product Assur															8									8
Instl Svcs															5									5
Procurement															16									16
Comptroller															10									10
Security															4									4
Plans															2									2
Mgmt Info															4									4
Tech Spt															28									28
Industrial Opns															34									34
Munitions Dev															17									17
Sub-Total															128									128
TMDE (FC Dev)															39									39
Mycology (Pitt-Dunn)															6									6
Lubricants (Pitt-Dunn)															12									12
Special Missions Sub-Total								10							185									195
Other Installations																								
Pine Bluff		1125	1125																			1125	1125	
Rocky Mountain		723	723																			723	723	
Ammo Plants		999	999																			999	999	
Sub-Total		2847	2847																			2847	2847	
GRAND TOTAL	731	6107	6838	838	2860	3698	4871	667	5548	607	2147	2754	1903	1541	3629	892		892	1935	421	2356	11777	13743	25715

1/ - DC + LC ≠ Total. Must add 195 Special Mission.

FIGURE I-1D-1 CONTINUED (4)

Source: Field representatives report

19 September 1974

ANNEX I-D2

PERSONNEL SKILL AND GRADE STRUCTURE
DISTRIBUTION

PERSONNEL SKILL AND GRADE

STRUCTURE DISTRIBUTION

PROFESSIONALS AND TECHNICIANS
IN TOTAL ARMAMENT COMMUNITY

	PROFESSIONAL	TECHNICIAN	TOTAL
HQ ARMCOM	439	185	624
PA	1,693	605	2,298
FA	671	553	1,224
EA	745	314	1,059
Rodman	363	164	527
Benet	163	132	295
BRL	424	162	586
TOTAL	4,498	2,115	6,613

Source: TDA's as of 30 July 1974

ARMAMENT COMMUNITY TOTAL
(PA, FA, EA, RODMAN, BENET, BRL, HQ ARMCOM)
SCIENTIFIC & ENGINEERING PERSONNEL

GRADE	BIOLOGICAL SCIENCES										MEDICAL SCIENCE			PHYSICAL SCIENCE					
	PSYCHOLOGY	GENERAL BIOLOGY	MICROBIO	PHARMACOL	PHYSIOLOGY	PLANT PATHOLOGY	PLANT PHYSIOLOGY	HORTICUL	HUSBANDRY	TOTAL BIOLOGICAL	GENERAL HEALTH	MEDICAL OFFICER	TOTAL MEDICAL	PHYSICAL SCIENCE	HEALTH PHYSICS	PHYSICIST	CHEMISTRY	METALLURGY	TOTAL PHYSICAL SCIENCE
	180	401	403	405	413	434	435	437	487	400	601	602	600	1301	1306	1310	1320	1321	1300
16														8			1		9
15		1					1			2				45		6	6	1	58
14		1		2	2					5	1	2	3	60		21	33	4	118
13	2	6	3	4	4	1		1	1	22				60	2	84	79	11	236
12	4	17	3	3	2		2	2		33				46	1	147	186	16	396
11	2	13	6		1					22				27	1	66	107	3	204
10																			
9		1								1				1		11	11		23
8																			
7																1			1
TOTAL	8	39	12	9	9	1	3	3	1	85	1	2	3	247	4	336	423	35	1045

ARMAMENT COMMUNITY TOTAL
(PA, FA, EA, RODMAN, BENET, BRL, HQ ARMCOM)
SCIENTIFIC & ENGINEERING PERSONNEL (CON'T)

	ENGINEERING														MATH SCIENCE					GRAND TOTAL
	GENERAL	SAFETY	MATERIAL	CIVIL	SANITARY	MECHANICAL	NUCLEAR	ELECTRICAL	ELECTRONICS	AERON	CERAMIC	CHEMICAL	INDUSTRIAL	TOTAL ENGR	OP RSCH SA	MATH	MATH STAT	STAT	TOTAL MATH	
	801	803	806	810	819	830	840	850	855	861	892	893	896	800	1515	1520	1529	1530	1500	
16	2					2						1		5						14
15	65		1			31	1		5	1		12	1	117	5	3			8	185
14	130	3	3	3	3	128	1	1	18	6		23	17	336	11	9	3		23	485
13	331	4	7	1	4	250	2		71	23		59	43	795	20	45	6	2	73	1126
12	472	6	15	8	11	386	2	5	126	33	1	90	64	1219	11	89	18	3	121	1769
11	202	8	6	3		171		6	69	5		25	17	512	7	47	14	1	69	807
10						1								1						1
9	5			3		37			9			5	12	71	4	4	5		13	108
8																				
7						1			1					2						3
TOTAL	1207	21	32	18	18	1007	6	12	299	68	1	215	154	3058	58	197	46	6	307	4498

PICATINNY ARSENAL

SCIENTIFIC & ENGINEERING PERSONNEL

GRADE	BIOLOGICAL SCIENCES										MEDICAL SCIENCE			PHYSICAL SCIENCE					
	PSYCHOLOGY	GENERAL BIOLOGY	MICROBIO	PHARMACOL	PHYSIOLOGY	PLANT PATHOLOGY	PLANT PHYSIOLOGY	HORTICUL	HUSBANDRY	TOTAL BIOLOGICAL	GENERAL HEALTH	MEDICAL OFFICER	TOTAL MEDICAL	PHYSICAL SCIENCE	HEALTH PHYSICS	PHYSICIST	CHEMISTRY	METALLURGY	TOTAL PHYSICAL SCIENCE
	180	401	403	405	413	434	435	437	487	400	601	602	600	1301	1306	1310	1320	1321	1300
16														2					2
15														7			1		8
14														5		5	8	1	19
13														30		13	16	1	60
12	1									1				20		21	48	3	92
11	2									2				19		7	25		51
10																			
9																			
8																			
7																			
TOTAL	3									3				83		46	98	5	232

PICATINNY ARSENAL

SCIENTIFIC & ENGINEERING PERSONNEL (CON'T)

	ENGINEERING														MATH SCIENCE					GRAND TOTAL
	GENERAL	SAFETY	MATERIAL	CIVIL	SANITARY	MECHANICAL	NUCLEAR	ELECTRICAL	ELECTRONICS	AERON	CERAMIC	CHEMICAL	INDUSTRIAL	TOTAL ENGR	OP RSCH SA	MATH	MATH STAT	STAT	TOTAL MATH	
	801	803	806	810	819	830	840	850	855	861	892	893	896	800	1515	1520	1529	1530	1500	
16	1					2								3						5
15	19		1			17			2	1		2	1	43						51
14	59	1	3		2	54		1	8	4		7	4	143		1			1	163
13	218	1	3		4	50			18	9		11	2	316	1	5	2		8	384
12	431	2	12		10	76			58	16	1	15	3	624		9	8		17	734
11	194		2	1		50		4	22	5		4	3	285		10	7	1	18	356
10																				
9																				
8																				
7																				
TOTAL	922	4	21	1	16	249		5	108	35	1	39	13	1414	1	25	17	1	44	1693

FRANKFORD ARSENAL
SCIENTIFIC & ENGINEERING PERSONNEL

GRADE	BIOLOGICAL SCIENCES										MEDICAL SCIENCE			PHYSICAL SCIENCE					
	PSYCHOLOGY	GENERAL BIOLOGY	MICROBIO	PHARMACOL	PHYSIOLOGY	PLANT PATHOLOGY	PLANT PHYSIOLOGY	HORTICUL	HUSBANDRY	TOTAL BIOLOGICAL	GENERAL HEALTH	MEDICAL OFFICER	TOTAL MEDICAL	PHYSICAL SCIENCE	HEALTH PHYSICS	PHYSICIST	CHEMISTRY	METALLURGY	TOTAL PHYSICAL SCIENCE
	180	401	403	405	413	434	435	437	487	400	601	602	600	1301	1306	1310	1320	1321	1300
16														3					3
15														4		3	1		8
14														5		9	1	1	16
13	1									1				2		20	9	1	32
12																35	19	3	57
11																36	18		54
10																			
9																9	7		16
8																			
7																			
TOTAL	1									1				14		112	55	5	186

I-DZ-6

FRANKFORD ARSENAL

SCIENTIFIC & ENGINEERING PERSONNEL (CON'T)

	ENGINEERING														MATH SCIENCE					GRAND TOTAL
	GENERAL	SAFETY	MATERIAL	CIVIL	SANITARY	MECHANICAL	NUCLEAR	ELECTRICAL	ELECTRONICS	AERON	CERAMIC	CHEMICAL	INDUSTRIAL	TOTAL ENGR	OP RSCH SA	MATH	MATH STAT	STAT	TOTAL MATH	
	801	803	806	810	819	830	840	850	855	861	892	893	896	800	1515	1520	1529	1530	1500	
16																				3
15	11					4			1			1		17						25
14	15			1		20			3			2	2	43		2			2	61
13	46					46			21			9	9	131		3		1	4	168
12	13			1		56		2	30			12	12	126	2	3	4		9	192
11	2		1	1		44		1	30			7	2	88	1	17	2		20	162
10																				
9						27			9			1	4	41		2			2	59
8																				
7									1					1						1
TOTAL	87		1	3		197		3	95			32	29	447	3	27	6	1	37	671

EDGEWOOD ARSENAL
SCIENTIFIC & ENGINEERING PERSONNEL

GRADE	BIOLOGICAL SCIENCES										MEDICAL SCIENCE			PHYSICAL SCIENCE					
	PSYCHOLOGY	GENERAL BIOLOGY	MICROBIO	PHARMACOL	PHYSIOLOGY	PLANT PATHOLOGY	PLANT PHYSIOLOGY	HORTICUL	HUSBANDRY	TOTAL BIOLOGICAL	GENERAL HEALTH	MEDICAL OFFICER	TOTAL MEDICAL	PHYSICAL SCIENCE	HEALTH PHYSICS	PHYSICIST	CHEMISTRY	METALLURGY	TOTAL PHYSICAL SCIENCE
	180	401	403	405	413	434	435	437	487	400	601	602	600	1301	1306	1310	1320	1321	1300
16																	1		1
15		1					1			2				4			4		8
14		1		2	2					5	1	2	3	11		1	22		34
13	1	6	3	4	3	1			1	19				10	1	9	42	1	63
12	3	17	3	3	2		2	1		31				8		11	81	1	101
11		13	6		1			2		22				3		6	42		51
10																			
9		1								1				1		1	3		5
8																			
7																1			1
TOTAL	4	39	12	9	8	1	3	3	1	80	1	2	3	37	1	29	195	2	264

EDGEWOOD ARSENAL
SCIENTIFIC & ENGINEERING PERSONNEL (CON'T)

	ENGINEERING														MATH SCIENCE					GRAND TOTAL
	GENERAL	SAFETY	MATERIAL	CIVIL	SANITARY	MECHANICAL	NUCLEAR	ELECTRICAL	ELECTRONICS	AERON	CERAMIC	CHEMICAL	INDUSTRIAL	TOTAL ENGR	OP RSCH SA	MATH	MATH STAT	STAT	TOTAL MATH	
	801	803	806	810	819	830	840	850	855	861	892	893	896	800	1515	1520	1529	1530	1500	
16												1		1						2
15	15					1						8		24						34
14	9	1				11				1		13	4	39	1	1	2		4	85
13	12	2	4			35			9	3		36	12	113	6	2			8	203
12	8	1				44			13	1		57	23	147	6	5	1	1	13	292
11	2	6	1			12		1	2			13	2	39	1	6			7	119
10																				
9	1													1	1	1			2	9
8																				
7																				1
TOTAL	47	10	5			103		1	24	5		128	41	364	15	15	3	1	34	745

RODMAN LABS

SCIENTIFIC & ENGINEERING PERSONNEL

GRADE	BIOLOGICAL SCIENCES										MEDICAL SCIENCE			PHYSICAL SCIENCE					
	PSYCHOLOGY	GENERAL BIOLOGY	MICROBIO	PHARMACOL	PHYSIOLOGY	PLANT PATHOLOGY	PLANT PHYSIOLOGY	HORTICUL	HUSBANDRY	TOTAL BIOLOGICAL	GENERAL HEALTH	MEDICAL OFFICER	TOTAL MEDICAL	PHYSICAL SCIENCE	HEALTH PHYSICS	PHYSICIST	CHEMISTRY	METALLURGY	TOTAL PHYSICAL SCIENCE
	180	401	403	405	413	434	435	437	487	400	601	602	600	1301	1306	1310	1320	1321	1300
16																			
15														6					6
14														14					14
13														3		2	3	1	9
12														2		3	7	2	14
11														4		12	18	2	36
10																			
9																			
8																			
7																			
TOTAL														29		17	28	5	79

RODMAN LABS

SCIENTIFIC & ENGINEERING PERSONNEL (CON'T)

	ENGINEERING														MATH SCIENCE					GRAND TOTAL
	GENERAL	SAFETY	MATERIAL	CIVIL	SANITARY	MECHANICAL	NUCLEAR	ELECTRICAL	ELECTRONICS	AERON	CERAMIC	CHEMICAL	INDUSTRIAL	TOTAL ENGR	OP RSCH SA	MATH	MATH STAT	STAT	TOTAL MATH	
	801	803	806	810	819	830	840	850	855	861	892	893	896	800	1515	1520	1529	1530	1500	
16																				
15	1					5								6						12
14						26			1					27						41
13	3					61			10					74		4			4	87
12						85			13					98		6			6	118
11			2			41			14					57		12			12	105
10																				
9																				
8																				
7																				
TOTAL	4		2			218			38					262		22			22	363

BENET LABS

SCIENTIFIC & ENGINEERING PERSONNEL

GRADE	BIOLOGICAL SCIENCES										MEDICAL SCIENCE			PHYSICAL SCIENCE					
	PSYCHOLOGY	GENERAL BIOLOGY	MICROBIO	PHARMACOL	PHYSIOLOGY	PLANT PATHOLOGY	PLANT PHYSIOLOGY	HORTICUL	HUSBANDRY	TOTAL BIOLOGICAL	GENERAL HEALTH	MEDICAL OFFICER	TOTAL MEDICAL	PHYSICAL SCIENCE	HEALTH PHYSICS	PHYSICIST	CHEMISTRY	METALLURGY	TOTAL PHYSICAL SCIENCE
	180	401	403	405	413	434	435	437	487	400	601	602	600	1301	1306	1310	1320	1321	1300
16																			
15														2				1	3
14														2				2	4
13														1		6	6	6	19
12																4	5	4	13
11																1	4	1	6
10																			
9																1	1		2
8																			
7																			
TOTAL														5		12	16	14	47

BENET LABS

SCIENTIFIC & ENGINEERING PERSONNEL (CON'T)

	ENGINEERING														MATH SCIENCE					GRAND TOTAL
	GENERAL	SAFETY	MATERIAL	CIVIL	SANITARY	MECHANICAL	NUCLEAR	ELECTRICAL	ELECTRONICS	AERON	CERAMIC	CHEMICAL	INDUSTRIAL	TOTAL ENGR	OP RSCH SA	MATH	MATH STAT	STAT	TOTAL MATH	
	801	803	806	810	819	830	840	850	855	861	892	893	896	800	1515	1520	1529	1530	1500	
16																				
15						1								1						4
14						7								7						11
13						31								31		6			6	56
12			3			32						1		36		3			3	52
11						18			1					19		1	1		2	27
10						1								1						1
9						7								7		1	1		2	11
8																				
7						1								1						1
TOTAL			3			98			1			1		103		11	2		13	163

BRL

SCIENTIFIC & ENGINEERING PERSONNEL

GRADE	BIOLOGICAL SCIENCES										MEDICAL SCIENCE			PHYSICAL SCIENCE					
	PSYCHOLOGY	GENERAL BIOLOGY	MICROBIO	PHARMACOL	PHYSIOLOGY	PLANT PATHOLOGY	PLANT PHYSIOLOGY	HORTICUL	HUSBANDRY	TOTAL BIOLOGICAL	GENERAL HEALTH	MEDICAL OFFICER	TOTAL MEDICAL	PHYSICAL SCIENCE	HEALTH PHYSICS	PHYSICIST	CHEMISTRY	METALLURGY	TOTAL PHYSICAL SCIENCE
	180	401	403	405	413	434	435	437	487	400	601	602	600	1301	1306	1310	1320	1321	1300
16														3					3
15														19		3			22
14														17		6	2		25
13					1					1				11	1	33	2	1	48
12														16	1	73	26	3	119
11														1	1	4			6
10																			
9																			
8																			
7																			
TOTAL					1					1				67	3	119	30	4	223

BRL

SCIENTIFIC & ENGINEERING PERSONNEL (CON'T)

	ENGINEERING														MATH SCIENCE					GRAND TOTAL
	GENERAL	SAFETY	MATERIAL	CIVIL	SANITARY	MECHANICAL	NUCLEAR	ELECTRICAL	ELECTRONICS	AERON	CERAMIC	CHEMICAL	INDUSTRIAL	TOTAL ENGR	OP RSCH SA	MATH	MATH STAT	STAT	TOTAL MATH	
	801	803	806	810	819	830	840	850	855	861	892	893	896	800	1515	1520	1529	1530	1500	
16																				3
15						2	1		1					4		3			3	29
14						4	1		1	1				7	1	4			5	37
13						15	2		6	11				34	1	21			22	105
12	3					32	2		11	16				64		61			61	244
11																				6
10																				
9																				
8																				
7																				
TOTAL	3					53	6		19	28				109	2	89			91	424

HQ ARMCOM

SCIENTIFIC & ENGINEERING PERSONNEL

GRADE	BIOLOGICAL SCIENCES										MEDICAL SCIENCE			PHYSICAL SCIENCE					
	PSYCHOLOGY	GENERAL BIOLOGY	MICROBIO	PHARMACOL	PHYSIOLOGY	PLANT PATHOLOGY	PLANT PHYSIOLOGY	HORTICUL	HUSBANDRY	TOTAL BIOLOGICAL	GENERAL HEALTH	MEDICAL OFFICER	TOTAL MEDICAL	PHYSICAL SCIENCE	HEALTH PHYSICS	PHYSICIST	CHEMISTRY	METALLURGY	TOTAL PHYSICAL SCIENCE
	180	401	403	405	413	434	435	437	487	400	601	602	600	1301	1306	1310	1320	1321	1300
16																			
15														3					3
14														6					6
13														3		1	1		5
12																			
11																			
10																			
9																			
8																			
7																			
TOTAL														12		1	1		14

HQ ARMCOM

SCIENTIFIC & ENGINEERING PERSONNEL (CON'T)

	ENGINEERING														MATH SCIENCE					GRAND TOTAL
	GENERAL	SAFETY	MATERIAL	CIVIL	SANITARY	MECHANICAL	NUCLEAR	ELECTRICAL	ELECTRONICS	AERON	CERAMIC	CHEMICAL	INDUSTRIAL	TOTAL ENGR	OP RSCH SA	MATH	MATH STAT	STAT	TOTAL MATH	
	801	803	806	810	819	830	840	850	855	861	892	893	896	800	1515	1520	1529	1530	1500	
16	1													1						1
15	19					1			1			1		22	5				5	30
14	47	1		2	1	6			5			1	7	70	9	1	1		11	87
13	52	1		1		12			7			3	20	96	12	4	4	1	21	122
12	17	3		7	1	61		3	1			5	26	124	3	2	5	2	12	136
11	4	2		1		6						1	10	24	5	1	4		10	34
10																				
9	4			3		3						4	8	22	3		4		7	29
8																				
7																				
TOTAL	144	7		14	2	89		3	14			15	71	359	37	8	18	3	66	439

ARMAMENT COMMUNITY TOTAL

(PA, FA, EA, RODMAN, BENET, BRL, HQ ARMCOM)

TECHNICAL SUPPORT PERSONNEL

	SAFETY TECH	BIO AID	MED TECH	ENG TECH	DRAFTING	ELECT TECH	IND ENG TECH	PHYS SCI TECH	LIBRARIAN	LIB TECH	TECH INTELL	MATH TECH	STAT ASST	EQUIP SPEC	TOTAL
	018	404	644	802	818	856	895	1311	1410	1411	1412	1521	1531	1670	
15														1	1
14														8	8
13	1			10		1	1		2					20	35
12	5			159		42	14	2	5		1	1		96	325
11	11			422		99	43	28	9		1	1		110	724
10		1		20		2		5							28
9	5	6	1	289		75	13	49	3		2	1	3	77	524
8		1		14				4							19
7		9		106	36	14	13	46		11	1	3	6	5	250
6		11		3	4			5		8		1	2	1	35
5		7		13	44		1	12		8		4	6		95
4		2		6	10			2		8		3	12		43
3				4	7					2			1		14
2				8	3			2		1					14
TOTAL	22	37	1	1054	104	233	85	155	19	38	5	14	30	318	2115

PICATINNY ARSENAL

TECHNICAL SUPPORT PERSONNEL

	SAFETY TECH	BIO AID	MED TECH	ENG TECH	DRAFTING	ELECT TECH	IND ENG TECH	PHYS SCI TECH	LIBRARIAN	LIB TECH	TECH INTELL	MATH TECH	STAT ASST	EQUIP SPEC	TOTAL
	018	404	644	802	818	856	895	1311	1410	1411	1412	1521	1531	1670	
15															
14															
13				3					1						4
12	2			49		20	3		2					6	82
11	9			143		42	9	2	4					21	230
10				1		2		2							5
9	2			107		30	2	14			1	1		17	174
8															
7				26	19	9	1	19		7			1	3	85
6					1										1
5				1	7		1	7		2			1		19
4				1	1					2					4
3										1					1
2															
TOTAL	13			331	28	103	16	44	7	12	1	1	2	47	605

FRANKFORD ARSENAL

TECHNICAL SUPPORT PERSONNEL

	SAFETY TECH	BIO AID	MED TECH	ENG TECH	DRAFTING	ELECT TECH	IND ENG TECH	PHYS SCI TECH	LIBRARIAN	LIB TECH	TECH INTELL	MATH TECH	STAT ASST	EQUIP SPEC	TOTAL
	018	404	644	802	818	856	895	1311	1410	1411	1412	1521	1531	1670	
15														1	1
14														2	2
13	1			7		1	1							5	15
12	1			66		10	10				1	1		20	109
11	1			88		12	34	10	1		1	1		30	178
10															
9	1			52		10	11	14	3		1			33	125
8								1							1
7				32		1	12	9				2	1	1	58
6								1		2		1			4
5				4	23			1		1		2	1		32
4				1	3			1		1		3	2		11
3				3											3
2				8	3			2		1					14
TOTAL	4			261	29	34	68	39	4	5	3	10	4	92	553

EDGEWOOD ARSENAL

TECHNICAL SUPPORT PERSONNEL

	SAFETY TECH	BIO AID	MED TECH	ENG TECH	DRAFTING	ELECT TECH	IND ENG TECH	PHYS SCI TECH	LIBRARIAN	LIB TECH	TECH INTELL	MATH TECH	STAT ASST	EQUIP SPEC	TOTAL
	018	404	644	802	818	856	895	1311	1410	1411	1412	1521	1531	1670	
15															
14														1	1
13									1					3	4
12	1			19		3			1					11	35
11				88		19		5	2					11	125
10		1		7				1							9
9		6	1	38		7		8					3	5	68
8		1		1				1							3
7		9		9	6			6		4					34
6		11			1					3					15
5		7								1			2		10
4		2						1		2			4		9
3													1		1
2															
TOTAL	1	37	1	162	7	29		22	4	10			10	31	314

RODMAN LABS

TECHNICAL SUPPORT PERSONNEL

	SAFETY TECH	BIO AID	MED TECH	ENG TECH	DRAFTING	ELECT TECH	IND ENG TECH	PHYS SCI TECH	LIBRARIAN	LIB TECH	TECH INTELL	MATH TECH	STAT ASST	EQUIP SPEC	TOTAL
	018	404	644	802	818	856	895	1311	1410	1411	1412	1521	1531	1670	
15															
14															
13															
12				15		1			1						17
11				39		3			1						43
10															
9				29		3		3							35
8															
7				14	6	2		4							26
6					2					1					3
5				6	14					2					22
4				3	6					1					10
3				1	7										8
2															
TOTAL				107	35	9		7	2	4					164

BENET LABS

TECHNICAL SUPPORT PERSONNEL

	SAFETY TECH	BIO AID	MED TECH	ENG TECH	DRAFTING	ELECT TECH	IND ENG TECH	PHYS SCI TECH	LIBRARIAN	LIB TECH	TECH INTELL	MATH TECH	STAT ASST	EQUIP SPEC	TOTAL
	018	404	644	802	818	856	895	1311	1410	1411	1412	1521	1531	1670	
15															
14															
13															
12				3					1						4
11				27		1		2							30
10				11				2							13
9				20		5		7							32
8				13				2							15
7				13				6							19
6				3				4		1					8
5				2				4		1		1			8
4				1						1					2
3										1					1
2															
TOTAL				93		6		27	1	4		1			132

BRL

TECHNICAL SUPPORT PERSONNEL

	SAFETY TECH	BIO AID	MED TECH	ENG TECH	DRAFTING	ELECT TECH	IND ENG TECH	PHYS SCI TECH	LIBRARIAN	LIB TECH	TECH INTELL	MATH TECH	STAT ASST	EQUIP SPEC	TOTAL
	018	404	644	802	818	856	895	1311	1410	1411	1412	1521	1531	1670	
15															
14															
13															
12	1			4		8		2						1	16
11	1			30		22		9	1						63
10				1											1
9	2			36		20		3						2	63
8															
7				7	5	2		2				1			17
6														1	1
5												1			1
4															
3															
2															
TOTAL	4			78	5	52		16	1			2		4	162

HQ ARMCOM

TECHNICAL SUPPORT PERSONNEL

	SAFETY TECH	BIO AID	MED TECH	ENG TECH	DRAFTING	ELECT TECH	IND ENG TECH	PHYS SCI TECH	LIBRARIAN	LIB TECH	TECH INTELL	MATH TECH	STAT ASST	EQUIP SPEC	TOTAL
	018	404	644	802	818	856	895	1311	1410	1411	1412	1521	1531	1670	
15															
14														5	5
13														12	12
12				3			1							58	62
11				7										48	55
10															
9				7										20	27
8															
7				5							1		4	1	11
6										1			2		3
5										1			2		3
4										1			6		7
3															
2															
TOTAL				22			1			3	1		14	144	185

ANNEX I-E1

TRANSFER OR REISSUE OF 74 RDTE FUNDS

INTERNAL TRANSFER OR REISSUE OF FY 74 RDTE FUNDS WITHIN ARMAMENT COMMUNITY

($ Million)

Issued By	Received By						Total Issued
	WA	FA	RIA	PA	EA	BRL	
WA		0.8	0.1	2.2			3.1
FA			0.1	0.3		0.3	0.7
RIA	0.1	0.3		0.1			0.5
PA	0.1	2.9	+a/		0.1	1.5	4.6
EA		+a/				0.6	0.6
BRL				0.6	0.6		1.2
TOTAL $ RECEIVED	0.2	4.0	0.2	3.2	0.7	2.4	10.7
HQ ARMCOM b/	8.8	9.4	15.5	47.5	29.6	1.5	112.3

a/ "+" indicates less than $50,000.

b/ Initial issue by HQ ARMCOM.

SOURCE: Reported in data submissions, July 1974, by transferring activity as issued on formal documentation, (Form 1095).

DATE: November 1974

I-E1-1

ANNEX I-E2

FY 74 DEVELOPMENT PROGRAM

ANNEX I-E2

FY 74 DEVELOPMENT PROGRAM

PICATINNY ARSENAL
($ MILLION)

BUDGET CATEGORY	IN-HOUSE	OGA	CONTRACT	TOTAL
RDTE	38.7	10.1	17.4	66.2
PEMA				
MACI	0.3		0.2	0.5
IPF	0.7		3.5	4.2
PIP	6.8		3.6	10.4
LRIP	0		0	0
PE-ASF[a/]	0		0	0
PE-PEMA SEC	0		0	0
PE-PEMA	0		0	0
MALFUNCTION	0.9		0	0.9
QA ENGR	7.1		0.9	8.0
GEN SPT ENGR	31.1		5.7	36.8
SUBTOTAL	46.9		13.9	60.8
MM&T	4.4		10.9	15.3
TOTAL PEMA	51.3		24.8	76.1
OMA				
ENGR	5.7		0.4	6.1
OTHER	2.2		-	2.2
TOTAL OMA	7.9		0.4	8.3
TOTAL	97.9		52.7	150.6

a/ PE = Production Engineering Support.

Figure I-E2-1

FRANKFORD ARSENAL
FY 74 DEVELOPMENT PROGRAM
($ MILLION)

BUDGET CATEGORY	IN-HOUSE	OGA	CONTRACT	TOTAL
RDTE	12.4	0.7	9.7	22.8
PEMA				
MACI	0.3		0.1	0.4
PIP	2.2		-	2.2
PE-PEMA	7.2		0.6	7.8
MM&T	2.1		1.8	3.9
TOTAL PEMA	11.8		2.5	14.3
OMA				
ENGR	2.4		0.6	3.0
OTHER	4.2		0.8	5.0
TOTAL OMA	6.6		1.4	8.0
TOTAL	30.8		14.3	45.1

Figure I-E2-2

EDGEWOOD ARSENAL
FY 74 DEVELOPMENT PROGRAM
($ MILLION)

BUDGET CATEGORY	IN-HOUSE	OGA	CONTRACT	TOTAL
RDTE	29.7	0.2	3.4	33.3
PEMA				
PIP	0.2	0		0.2
PE-PEMA	3.7	0.7		4.4
QA ENGR	0.5	0		0.5
MM&T	3.5	0.3		3.8
TOTAL PEMA	7.9	1.0		8.9
OMA				
ENGR	1.0	0		1.0
OTHER	4.1	-		4.1
TOTAL OMA	5.1			5.1
TOTAL	42.1	4.6		47.3

Figure I-E2-3

ROCK ISLAND ARSENAL
FY 74 DEVELOPMENT PROGRAM
($ MILLION)

BUDGET CATEGORY	IN-HOUSE	OGA	CONTRACT	TOTAL
RDTE	16.7	0.4	1.1	18.2
PEMA				
PIP	0.5	0		0.5
PE-PEMA	2.9	0.7		3.6
MM&T	0.4	-		0.4
TOTAL PEMA	3.8	0.7		4.5
OMA				
ENGR	1.9	0.2		2.1
OTHER	0.6	0		0.6
TOTAL OMA	2.5	0.2		2.7
TOTAL	23.0	2.4		25.4

Figure I-E2-4

WATERVLIET ARSENAL
FY 74 DEVELOPMENT PROGRAM
($ MILLION)

BUDGET CATEGORY	IN-HOUSE	OGA	CONTRACT	TOTAL
RDTE	10.9	0.7	0.1	11.7
PEMA				
PIP	0.4		0.1	0.5
PE-PEMA	2.2		0.3	2.5
MM&T	0.6		0.1	0.7
TOTAL PEMA	3.2		0.5	3.7
OMA				
ENGR	1.4		0	1.4
OTHER	3.0		0	3.0
TOTAL OMA	4.4		0	4.4
TOTAL	18.5		1.3	19.8

Figure I-E2-5

BALLISTIC RESEARCH LABORATORIES
FY 74 DEVELOPMENT PROGRAM
($ MILLION)

BUDGET CATEGORY	IN-HOUSE	OGA	CONTRACT	TOTAL
RDTE	22.3	8.7	4.8	35.8
PEMA				
GEN SPT ENGR	0.2	0		0.2
OMA				
OTHER		0.2		0.2
TOTAL	22.5	13.7		36.2

Figure I-E2-6

HQ ARMCOM & PMs
FY 74 DEVELOPMENT PROGRAM
($ MILLION)

BUDGET CATEGORY	IN-HOUSE	OGA	CONTRACT	TOTAL
RDTE				
HQ	4.0	7.6	-	11.6
CAWS	0.6	2.8	5.7	9.1
VRFWS	0.9	0.1	0.1	1.0
TOTAL RDTE	5.5	10.5	5.8	21.8
PEMA				
CAWS	-	0.3	0.5	0.8
TOTAL	5.5	10.8	6.3	22.6

Figure I-E2-7

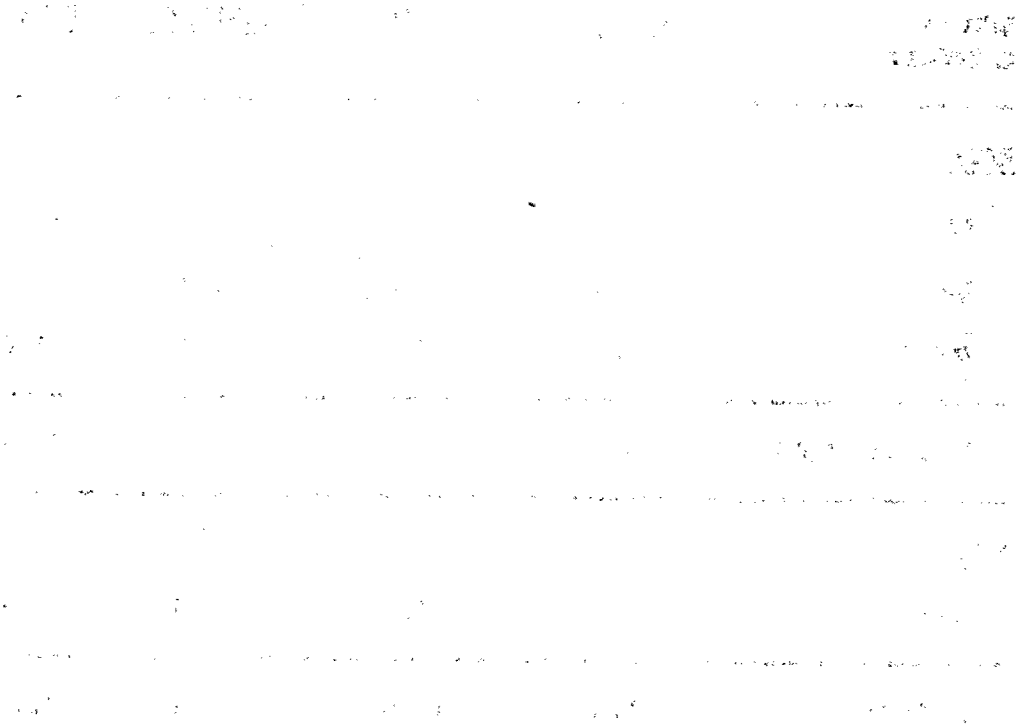


Figure I-E2-8

ANNEX I-F

LAND FACILITIES AND EQUIPMENT

LAND & IMPROVEMENTS SUMMARY[a/]
CURRENT ARMAMENT DEVELOPMENT COMMUNITY

INSTALLATION/ACTIVITY	ACRES	ACQUISITION COST ($MILLION)	REPLACEMENT VALUE ($MILLION)
Picatinny Arsenal	6,491	5.0	61.3
Rock Island Arsenal	908	4.1	8.6
Watervliet Arsenal	147	0.1	2.2
Frankford Arsenal	127	1.6	12.2
Edgewood Arsenal	2,660[b/]	0.2	1.3
Ballistic Research Lab	3,263[b/]	0.2	1.5
Harry Diamond Lab	2,807[c/]	7.1	9.6[d/]
TOTAL	16,403	$18.3	$96.7

a/ Improvements are roads, rail lines, etc. Buildings and structures are shown in facilities summary.

b/ Acres shown are totals assigned to tenant activities. Total available acreage of Aberdeen Proving Ground, host installation includes 79,369 upland and under water acres.

c/ HDL scheduled to lose 2,000 acres; 807 acres will remain.

d/ Actual replacement cost $42.8 million for site and new building.

SOURCE: AMC Installation and Activity Information Summary (AMCIS-102), 1st Qtr FY 74.

DATE: September 1974

Figure I-F-1

TOTAL FACILITIES SUMMARY a/
CURRENT ARMAMENT DEVELOPMENT COMMUNITY

INSTALLATION/ACTIVITY	NUMBER OF BUILDINGS (Each)				GROSS SQUARE FEET (GSF) (Million)				ACQUISITION COST ($ Million)				REPLACEMENT VALUE ($ Million)			
	DEV b/	LOG c/	OTHER d/	TOTAL	DEV	LOG	OTHER	TOTAL	DEV	LOG	OTHER	TOTAL	DEV	LOG	OTHER	TOTAL
PICATINNY ARSENAL	761	83	570	1,414	2.0	0.2	1.8	4.0	31.1	2.8	32.0	65.9	212.6	19.0	211.8	443.4
ROCK ISLAND ARSNEAL	34	50	171	255	0.5	2.3	3.6	6.4	4.7	13.2	35.9	53.8	22.7	190.6	133.6	346.9
WATERVLIET ARSENAL	14	27	50	91	0.2	1.2	0.7	2.1	1.5	11.3	6.4	19.2	17.0	98.3	19.2	134.5
FRANKFORD ARSENAL	82	48	94	224	1.2	0.7	0.9	2.8	11.2	6.9	32.8	50.9	41.8	26.3	123.4	191.5
EDGEWOOD ARSENAL	176	19	127	322	1.2	0.3	0.6	2.1	26.4	2.5	6.2	35.1	75.4	7.4	17.1	99.9
BALLISTIC RES LAB	125	-	-	125	0.7	-	-	0.7	6.0	-	-	6.0	23.5	-	-	23.5
HARRY DIAMOND LAB	45	-	51	96	0.5	-	0.1	0.6	7.1	-	-	7.1	8.7	-	0.9	9.6
TOTAL	1,257	227	1,063		6.3	4.7	7.7		88.0	36.7	113.3		401.7	341.6	506.0	
GRAND TOTAL				2,527				18.7				238.0				1,249.3

a/ Facilities - Includes buildings, structures and ranges.
b/ Development - Includes facilities used primarily in support of Development Center type activities regardless of official facilities classification.
c/ Logistics - Includes facility used primarily in support of Logistics Center type activities regardless of official facility classification.
d/ Other - Includes those facilities which do not directly support development or logistics activities.

Source: Direct Survey Request Submission by surveyed installations and activities 5 July 1974; AMC Installation and Activity Information Summary (AMCIS-102), 1st Qtr FY 74; telephonic follow-up to surveyed installations and activities.

Date: September 1974

Figure I-F-1

EQUIPMENT SUMMARY[a/]
CURRENT ARMAMENT DEVELOPMENT COMMUNITY

Installation/Activity	DEVELOPMENT[b/] Pieces	DEVELOPMENT[b/] $ Mil	LOGISTICS[c/] Pieces	LOGISTICS[c/] $ Mil	OTHER[d/] Pieces	OTHER[d/] $ Mil	TOTAL Pieces	TOTAL $ Mil
Picatinny Arsenal	6,996	25.3	2,899	9.5	67	6.0	9,962	40.8
Rock Island Arsenal	344	5.2	5,144	139.5	173,975	133.3	179,463	274.4
Watervliet Arsenal	1,208	3.6	250,363	89.6	21,691	9.4	273,262	102.6
Frankford Arsenal	9,013	7.0	4,407	26.8	38,697	15.2	52,117	49.0
Edgewood Arsenal	17,410	19.8	2,208	7.3	8,788	5.3	28,406	32.4
Ballistic Research Lab	1,039	7.3	--	--	24,111	34.3	25,150	41.6
Harry Diamond Lab	2,419	8.5	485	3.0	17,670	12.2	20,574	23.7
TOTAL	38,429	76.7	265,506	272.1	284,999	215.7		
					GRAND TOTAL		588,933	564.5

a/ Equipment items identified as mission essential.
b/ Development includes all items utilized primarily for support of development center type activities regardless of the official equipment federal stock class (FSC) designation.
c/ Logistics includes all items utilized primarily for support of logistic center type activities regardless of the official equipment FSC designation.
d/ Other includes all items not specifically apportioned to use primarily in support of development or logistics activities.

SOURCES: Direct survey request submissions by each installation/activity, 5 July 1974; AMC Installation Equipment Report (AMCIS-164), 1st Quarter FY 74; AMC Installation and Activity Information Summary (AMCIS-102), 1st Quarter, FY 74; telephonic reconciliation with each installation/activity.

DATE: September 1974

Figure I-F-3

ANNEX I-G

STRENGTH AND WEAKNESSES

STRENGTHS AND WEAKNESSES

Summary. During the gathering of data on the current system, an attempt was made to identify strengths and weaknesses, in part to compare with AMARC, but primarily to assist in the development of the ADC concept plan. There is general concurrence with AMARC; differences and areas not mentioned by AMARC are included in the ensuing discussion. The information in this annex supplements that in the main report.

a. Requirements. The committee agrees with the AMARC comments relative to requirements. There are now attempts at HQ DA and below to make improvements, including the screening of new requirements for real need and feasibility. There has been a little progress in this area--cancelling requirements--but this does not lead to fielded items. In support of the AMARC finding, the committee found a tendency to request sophisticated equipment to make up for training problems, e.g., sights which compensate for the soldier not knowing whether to point the weapon ahead of or behind a moving vehicle and higher velocity projectiles to eliminate the need for range estimation. There will be a continuing need for an active and effective mechanism for bringing the requirements maker, the developer, and the resource allocator together to curb the tendence of the user to ask for more than he needs to meet the real operational shortfall and the tendency of the developer to blindly accept or to encourage these requirements. The following are illustrative examples:

(1) Range probable error (RPE) requirements need careful examination and analysis because of cost implications. Requirements for accuracy, particularly at the longer ranges, have not always been supportable by cost-operational effectiveness analyses.

(2) There is a slow reaction to small development requirements; getting the requirement established occasionally takes as long as the development effort.

(3) Lack of coordination of operational performance characteristics for the entire system. Example: Artillery piece operate to -45°F; propellant to -65°F; nuclear projectile to -25°F.

(4) Lack of selectivity in establishing requirements to design and produce everything for all climatic conditions. Consideration of climatic kits for those few to encounter extreme environments might reduce costs.

(5) Lack of a realistic "acceptable failure rate."

(6) Perhaps a judiciously applied five percent "acceptable dud rate" rather than one percent could save millions in ammunition costs.

b. Program Operation. AMARC gave credit for some pending improvements in the overall program direction and operation, but also pointed out many weaknesses in this area requiring both high and middle management attention. In general, the present committee agrees with the AMARC discussion but does have some disagreement and some additional perceptions.

(1) We disagree that the lead laboratory concept has eliminated duplication or been well applied in all cases. There are still duplicative efforts in vision devices and fire control, lubricants, materials, energetic materials, nuclear effects and others. Often there is good reason for the duplication such as different applications or geographic separation. Lead laboratories have not always been effective and have not supplied the answer needed, leading to further duplication. In one case, fuzes, the lead laboratory is not a part of the organization having overall munitions responsibility.

(2) AMARC found that producibility, maintainability, and quality engineering, and RAM assessments were not introduced early enough. The present committee believes this is a generalization not universally true in armaments. Certainly it has, does, and will probably continue to occur on specific programs, but discussion with developers showed an almost universal acceptance of the principle of bringing in these considerations as early as possible. Further improvement probably can be made, and collocation of elements may make timely and proper integration easier. Specific provision must be made to maintain the physical and command linkage with the production know-how in manufacturing facilities or pilot plants.

c. Management. AMARC also identified both good and bad points in program management. We agree that most of their comments apply to the armament community and to the headquarters above that community.

(1) There is now an attempt, within ARMCOM, to establish a technique for total systems integration via a matrix type of management. This technique has been used for years in nuclear munitions programs and others but has met some resistance from subordinate commanders who fear loss of control of their assets without commensurate reduction of responsibility. There are other managerial techniques available which have not been applied, or have been applied without good consideration of the real management need. We fully agree with AMARC that management of small programs, which in aggregate utilize much of the resources, is by neglect.

(2) By and large, the AMARC comments on cost/operational effectiveness, life cycle cost, logistic assessment, design-to-cost, risk assessment, and similar areas do apply in armament as well as other areas. In addition, however, there appears to be a real lack of independent assessment for things done in-house. Contractor prepared costs, schedules, risks, technical approach, etc., are critically reviewed by in-house personnel. There is no similar review of in-house prepared programs except by staffs having, to some degree, vested interests, either for or against.

(3) There is a need to exercise more frequently both judgment and flexibility in determining whether each item should pass through the standard cycle of development and acceptance. In some instances where the risk and consequences of failure are low, the cost in time and dollars of full testing and acceptance appears to be greater than the cost of early acceptance and production, even if the accepted item proves to be not completely satisfactory in use. In brief, in judicious shortcutting there is a possible saving and, at worst, no loss. In most cases encountered where this possibility appeared, the development team was completely dedicated to fulfilling procedural requirements, and no one appeared to be examining the cost of proceeding routinely.

(4) Although there has been progress in delaying or cancelling programs of questionable worth, there are still "pet programs" at all levels. Recommendations to kill programs sometimes meet real resistance at higher levels.

(5) There has been relatively little acceptance of the uncertain nature of R&D at all levels. Costs, schedules, risks are optimistically stated, and firmly set much too early, as AMARC indicated. There is almost never included a contingency allowance for schedules and costs. This does, however, appear to be improving in recent program documentation.

d. Personnel.

(1) AMARC made a point of short tenure in high places. This also related to lower levels. Use of military to command development elements tends to lead to short-range tampering in order to "make a mark." As AMARC stated, the use of a civilian deputy does not always assure consistent and continuing technical and program guidance. The other side of this coin is the need for military participation to maintain a field-oriented attitude early in development.

(2) The geographical dispersion of talent carries with it compartmentation into separate personnel administration units and a degree of personal immobility. This in turn makes it difficult to move people to where their talents would be most useful.

(3) On the good side of the ledger, we noted personnel in the system thoroughly knowledgeable in all aspects of fielding and supporting armaments. Thus, there is a talent bank of "smart buyers" to deal with contract operations. Design engineers recognize a responsibility going beyond having the design accepted. Long tenure of personnel provides a storehouse of knowledge of both past mistakes and how something now out of production was made last time. Use of design engineers to evaluate changes and reduce production stoppages helps cut costs without unduly affecting performance. REFLEX, properly applied, appears to greatly assist in adjusting work force to work load.

e. Funding. In the area of funding, we definitely agree with the AMARC comments on insufficiency of discretionary funds and erosion of the technology base.

(1) Discretionary funds are provided each technical director, but they are small. As also indicated by AMARC, many promising ideas have been stifled because there was no requirement; and the discretionary funds could only support the work so far. If we are to pursue new ideas to prototype and feasibility stage, there must be some increased flexibility in this area. Regulatory restrictions may have to be changed to permit this flexibility.

(2) In addition to the inflationary erosion alluded to by AMARC, there has been a continual technology program degradation through decrementing of funds. To make funds available to keep engineering development (6.4) projects on schedule under budget reductions, funds have been reduced in technology areas, primarily 6.2 and 6.3. This degradation disrupts orderly progress, adds costs, causes severe workload fluctuations, and delays the technology needed for improved weapons. Several past studies have indicated the need for a stable technology base. Achievement may have to be at the expense of engineering development schedules.

(3) Also mentioned by other studies is the burden placed on development and other customers in the form of overhead, to maintain under-utilized but needed production facilities. Hopefully, a better definition of a realistic force structure and improved mobilization planning will alleviate at least some of the burden.

Part of the burden properly should be borne by development, such as use of a manufacturing facility to make prototypes or limited production runs for feasibility demonstration and testing. We do not argue that the capabilities are not needed. Past experience shows that in an emergency these old, under-utilized facilities, and the people associated with them, are called on to fill a vital gap until civilian industry can be converted and to assist in the conversion. Even in peacetime they are used to make small quantities of items required quickly. The point is that these facilities, whenever absolutely required, should be funded separately as a part of a mobilization requirement and not as an overhead burden on customers.

f. Other. It appears that there has been a tendency to substitute statistical analysis for real data analysis. A retrospective look at several items of equipment which encountered problems showed that similar problems did occur during testing but were treated as anomalies or as unimportant since they occurred only once or twice in hundreds of firings. However, to stop the program and perform a root cause analysis on every unexpected happening in the development of a weapon, and the qualification of all available rounds of ammunition in it, would be prohibitively expensive in both time and money. New ideas are needed on ways of separating the critical from the non-critical occurrences.

ANNEX I-H

TOPICS FOR SPECIAL CONSIDERATION

ANNEX I-H

TOPICS FOR SPECIAL CONSIDERATION

1. General. Several topics that should merit special attention during the implementation phase of forming an Armament Development Center (ADC) and an Armament Logistics Command (ALC) were discussed during visits to six GOCO's, one GOGO and two contractor plants. The information obtained from the contractors and resident government personnel is contained in this annex. Caution must be used in applying any suggestions in these topics. All discussions and observations leading to these statements were ammunition related. It is believed that many of the ideas expressed are also applicable to weapons and fire control. Application, however, must be tempered by the differences in safety, reliability, maintainability, storability, and producibility considerations which distinguish production of millions or billions of explosive, low cost, one shot items from production of hundreds or thousands of relatively non-hazardous, high cost, long-life items.

2. Visits and Trip Reports. Further discussion of these topics may be found in trip report files of the AMC Committee-Armament. Review of these reports is recommended prior to application of these topics to the ADC. The specific installations visited were:

GOCO

1. Twin Cities AAP
2. Milan AAP
3. Holston AAP
4. Radford AAP
5. Scranton AAP
6. Lone Star AAP

GOGO

1. Pine Bluff Arsenal

Contractor Plants

1. Honeywell Corp.
2. Chamberlain Corp.

3. Link to User. Universally emphasized was the necessity for close and continuous ties between producer and developer, especially through the informal organization. Emphasized by both producer and developer, was the thought that these ties must be maintained in the ADC/ALC split; not only maintained, but, if possible, improved.

Both developer and producer must be free to call or visit each other on an informal basis as is now done. Forming the ADC/ALC must not interpose any more barriers to the informal level interchange than now exists. The formal interchange must, if possible, be bettered.

4. Production Facilities. Production facilities, both GOCO and COCO, feel they can make a contribution during the design stages of development. Input by personnel knowledgeable in mass production methods, techniques and machinery can contribute to the producibility and inspectability of the design. It was suggested that production and quality assurance personnel from production plants be invited to review designs on some periodic basis. It was emphasized, however, that this should not be limited to one or two plants but should include all plants having a capability for production of that item. Plants do not use the same machinery, methods or processes. A design fully suitable for one plant may cause severe difficulties in another. Therefore, all potential producers should be invited. It was anticipated that the costs involved would be more than offset by production savings. (Note: There are probably anti-trust as well as competitive bidding implications to this suggestion.) Almost all contractors (GOCO and COCO) indicated a willingness to participate but acknowledge that legal and regulatory implications must be studied. The benefits in decreased engineering support to production should be well worth the effort. Having producers, or potential producers, assist in review of the producibility and inspectability of new designs could also provide benefits in improving the production cost estimates for the item (and thus better design-to-cost data), and in more realistic bids on production. Their advance knowledge of the design should result in more realistic costs in bids submitted in response to competitive invitations. (Note: There are unfair competition aspects to this idea. However, for LAP to be done only in GOCO it should be possible. For metal parts or other GOCO purchased items, it would probably be necessary to exclude all commercial contractors from advanced knowledge unless necessary regulatory waivers can be obtained.)

5. Mobilization Planning. Having potential producers review early design concepts and development designs, should assist in mobilization planning. A better evaluation of the potential production rate for producer would result, and thus, a better estimate of the number of producers required during mobilization. This may be increasingly important for new designs which may never be made at mobilization rates until actual mobilization.

6. Producibility Refinement. Using a production facility to make DT/OT quantities, or even low developmental quantities, should result in further refinements of producibility, inspectability, rate potentials and costs of production. There is one severe drawback--the producer of any quantity will have a large competitive edge over

plants which have not produced, when competitive bidding is requested. (This advantage does not mean that the pilot producer will necessarily have the low bid. Other competitors may underbid legitimately or because of lack of familiarity with production difficulties. The pilot producers bid should be the most realistic unless he deliberately "buys-in.")

7. Other Considerations. In the design of new items both the product and the process for producing it must consider pollution abatement and occupational health and safety standards. Again, the mass production plants believe they can be of assistance to the developer. This is of increasing importance both to reduce present pollution and hazard levels to meet present requirements and to project to future, more restrictive requirements. The ammunition production base modernization program must consider projected future designs, ecological, health, and safety requirements, in addition to making production of present designs more efficient. Designers working on future munitions and producers making present designs should both participate in modernization decisions.

8. New Equipment Planning. Mass production plant operators (GOCO contractors) should be consulted on the design and development of new production plant equipment. Most producers of presses, conveyors, forges, etc., have no concept of the peculiarities applying to the mass production of ammunition items. Few of todays development engineers have mass production experience. Use of producer experience may prevent costly and time consuming mistakes.

9. Loss of Expertise. Care must be exercised to prevent serious loss of in-house expertise during the formation of an ADC/ALC. Experiences in trying to produce items when design personnel were no longer available (quit, transferred, died, etc.) have been bad. In-house engineers provide the continuity and corporate memory for items developed on contract. Almost the entire expertise in military explosives and propellants resides in personnel at Picatinny Arsenal. Failure to retain this munitions knowledge could lead to a greatly reduced mobilization capability until it can be rebuilt.

10. Engineering Support to Production. A decrease in current engineering-support-to-production capability in the ADC may have to be compensated by an increase in the ALC. This increase could be in-house or procured at AAPs. Manning should be attuned to workload to preclude a situation where a shortage of secondary work would cause expensive underutilization.

11. Engineering Prototypes. The AAPs and other volume production facilities are not well suited to prototyping or R&D quantity (10's and 100's) production operations. If necessary, special experimental lines could be established for certain classes of items at various plants. Such lines would be expensive, underutilized, and

subject to reconversion if production demands changed. Operation of such lines would be dependent on utilization of production line personnel during slack periods and, thus, subject to long delays in a field where rapid response is required. Nearly all producers visited have done job-shop type operations in the past and are doing some now. In most cases, old equipment, more adaptable to batch type work, than the modern high volume equipment, is used for these small jobs. Such equipment is, or can be made, available if the ADC is willing to pay increased costs. (Note: Special contract and funding arrangements would be necessary.) COCO plants visited have, associated with their R&D establishment, prototyping shops. Small numbers of prototypes (in the tens) are fabricated by technicians in their shops. Large numbers are sent to an associated job-shop. All producers, GOCO and COCO, believed the ADC must have, or have readily available, its own prototype/pilot capability for producing any item for which it is responsible. This shop capability is necessary to ensure the designer has opportunity for "hands-on" experience in the producibility of his design. It is not the entire answer to producibility, but it is a necessary part. The planned ADC shop will need such capabilities as making basic parts, propellants, explosives, and going through the entire load, assemble, and pack.

12. Initial Production/Tech Data Package. Low rate initial production (LRIP) must be done prior to finalizing the technical data package (TDP). The initial full production run, whether DT/OT III or for stockpile should utilize the finalized TDP. This initial full production run should also be done on a volume production line (a fully "de-bugged" pilot line) at a production facility. The quantity and the rate of production must both be sufficiently high to permit an accurate evaluation of the capability to meet the mobilization requirements.

13. Material Changes. There is more emphasis needed on changes in materials. The ADC should pay close attention to changes in industry standards for materials such as chemicals and steels. Evaluations should be made of the impact of new industry standards on the performance or storageability of items. This is increasingly important as material shortages, lead times and costs increase. In some cases suppliers of military specification materials are now sole source and even that source supplies only under duress from government. The use of high carbon steels, such as HF-1, to achieve increased fragmentation effectiveness will result in an increased production cost. Some effort in improving fragmentation of standard, more easily worked steels, may have a large cost payoff.

14. Redesign. In many cases it may prove cost effective to re-engineer old standard items still in production. Many are still being made by processes, and using materials, designated 20 years

ago. Without changing performance requirements, re-engineering to modern methods and materials may provide cost savings. At least two firms and one GOCO are willing to undertake such engineering studies or programs, to include proving the new method by suitable production runs on pilot lines.

15. ECPs/Waivers/Deviations. In establishing an ADC, attention should be given to the management of engineering change proposals (ECP), deviations and waivers. Now, approval is extremely slow in many cases. The same deviations and waivers are submitted on the same TDP year after year. The commonly expressed feeling was that this situation would get worse when both ADC and ALC must agree. A method of obtaining rapid reaction must be established. While it is not suitable to incorporate repeated deviations or waivers into the TDP (those fitting one plant cause more problems in another) they could be packaged, by producer, and given automatic acceptance for that producer.

16. Ballistics Testing. Reaction time on ballistics and performance testing of production items having problems is an area requiring attention. Routine lot acceptance testing is usually accomplished in a timely fashion. But for items having production problems the proof firing of alternate fixes is sometimes delayed for months awaiting range time. Meanwhile, thousands or millions of rounds could be produced. Contractors believe a need exists for better access to use of government test facilities. The expense of establishing and maintaining test facilities limits contractors' capabilities. If contractor personnel could utilize government facilities more freely there should be a benefit to the government.

17. Pitfalls of Modernization. Some reservations about the modernization program were expressed. Most prominent was a fear that automation will decrease the capability to rapidly expand in a mobilization. Automation machines are time consuming to build, site, "de-bug" and get operating. But automation production during peacetime will have resulted in tear down of the old hand lines and loss of the knowledge of operating personnel. The rapid expansion capability provided by hand lines will no longer be available when needed. Also expressed was a feeling that different producers may move out in different directions in modernizing lines for the same product, resulting in massive difficulty during mobilization. Careful division of MMT between the ADC and ALC can preclude delaying urgently needed programs or promoting the divergence.

18. Contractor Interest. Several producers indicate some interest in performing the small lot production and emergency job-shop production now being done in arsenals considered in the ADC study. They did caution, however, that there would have to be some assurance of continuing utilization to make such an investment worthwhile.

ANNEX I-I

COMMODITY COMMAND STRENGTHS

COMMODITY COMMAND STRENGTHS

A comparison of ARMCOM and the development center base line with other AMC commodity commands emphasizes the subordination of development to logistics within the armament community. The Armament Command, with BRL and the associated 32,000 contractor personnel in the Army Ammunition Plants is over 57,000 personnel. This large command is supervised by one major general, with a brigadier general as deputy commander and a brigadier general as Director of Procurement and Production, plus the Director of BRL. Looking only at the development portion, plus its attendant security and installation support, the described ADC base line amounts to 11,777 personnel, again including BRL. This number is comparable to the next largest AMC commodity command, ECOM, and far exceeds the comparatively smaller commodity commands, as shown in Figure I-I-1. In fact, the development portion only is twice as large as AVSCOM or TACOM. Each of these commodity commands is commanded by a major general with a brigadier general deputy commander. This contrasts dramatically with the development portion of armament which is supervised full time by a colonel on the ARMCOM staff and the director of a separate activity, BRL.

Commodity Command Strengths
30 June 1974

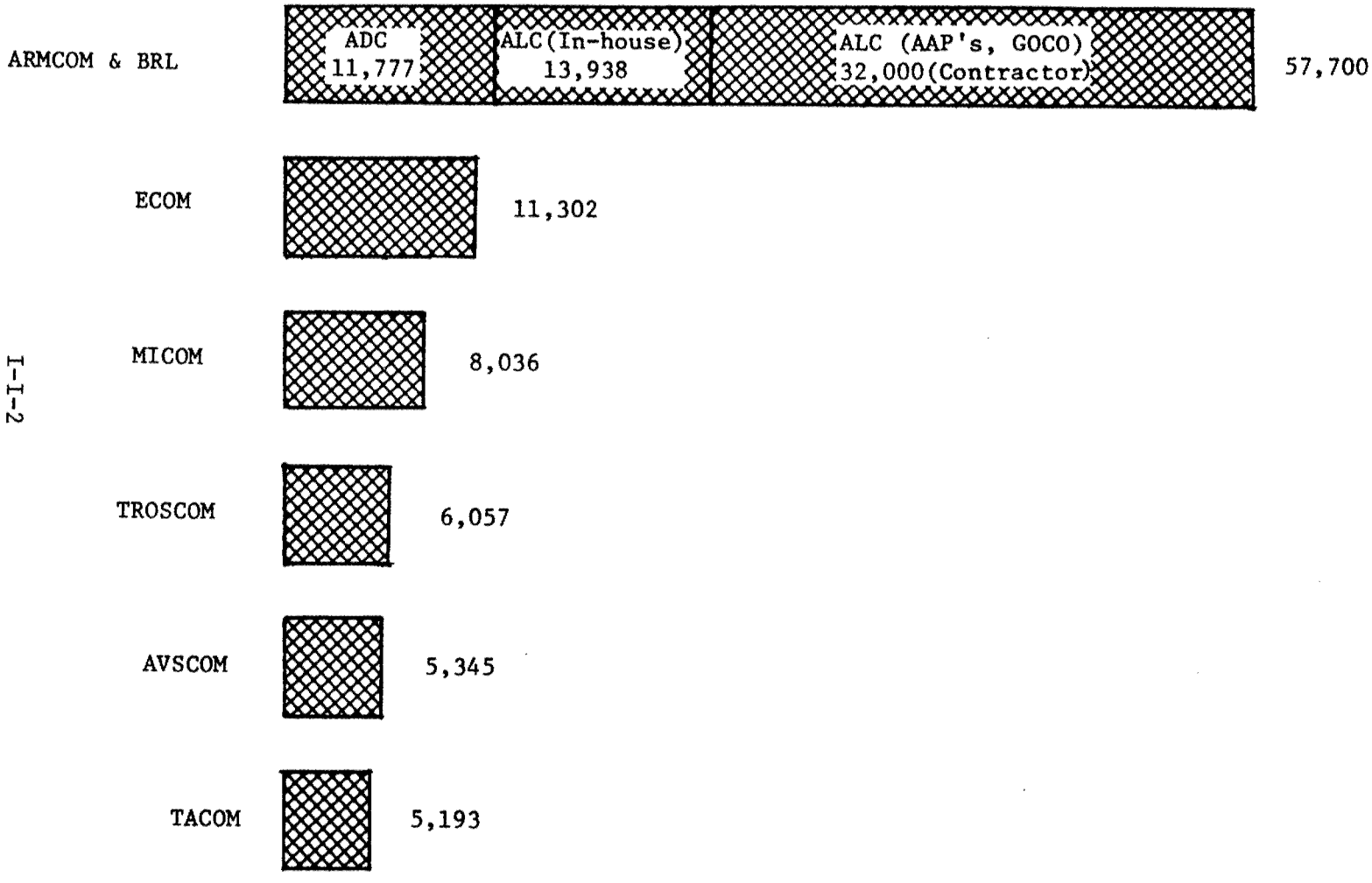


Figure I-I-1

CHAPTER II

ANNEXES

CHAPTER II

ANNEXES

ANNEX II-A

COMMITTEE ORGANIZATION

CONCEPT TEAM MEMBERS, REPRESENTATIVES, AND CONSULTANTS

A. CONCEPT TEAM MEMBERS

COL Alan A. Nord, Chief

Mr. James A. Bender, Deputy

Mr. Tamio Shirata, Deputy

Mr. Nelson R. Denton

LTC James F. McCall

LTC Philip A. Pryor

COL James E. Wyatt

B. CONCEPT TEAM FIELD REPRESENTATIVES

1. ARMCOM Headquarters

   Dr. Edward J. Haug

2. Rock Island Arsenal (RIA)

   LTC Herbert H. Dobbs

   Dr. Donald A. Gyorog

3. Picatinny Arsenal (PA)

   Mr. Clifford C. Cavanaugh

   Mr. Frederick E. Saxe

   Dr. Eugene G. Sharkoff

4. Watervliet Arsenal (WA)

Mr. Paul K. Rummel

COL Richard H. Sawyer

5. Frankford Arsenal (FA)

Mr. Seymour Miller

Mr. George R. Staton

6. Edgewood Arsenal (EA)

Dr. Frank Shanty

7. Ballistics Research Laboratories (BRL)

Mr. Orrin C. Kaste

Mr. Harry L. Reed

8. Missile Command (MICOM)

Dr. Donald Jackson

C. CONCEPT TEAM CONSULTANTS

1. Dr. Gerald P. Dinneen, Director and Professor of Engineering, Lincoln Laboratory, Massachusetts Institute of Technology.

2. Dr. Gus D. Dorough, Jr., Associate Director, Lawrence Livermore Laboratory.

3. Dr. James J. Renier, Vice President, Aerospace and Defense Group, Honeywell, Inc.

4. Mr. Thomas R. Stuelpnagel, Vice President and General Manager, Hughes Helicopter.

5. Mr. Ray Thorkildsen, Staff Specialist for Ordnance Technology, Engineering Technology, Office of the Director Defense Research and Engineering.

ANNEX II-B

SUMMARY OF ACTIVITIES

ANNEX II-B

SUMMARY OF ACTIVITIES

A. IPR FOR AMC COMMAND GROUP

2 July 1974

2 August 1974

16 September 1974

B. MEETINGS WITH GENERAL LEWIS' ADVISORY GROUP

15 July 1974

1 August 1974

C. MEETINGS WITH CONSULTANTS

25 July 1974 - Dr. Dorough, Mr. Stuelpnagel, and Mr. Thorkildsen

26 July 1974 - Dr. Dinneen

5 August 1974 - Dr. Renier

15 August 1974 - Dr. Dinneen, Dr. Renier, and Mr. Thorkildsen

21 - 22 August 1974 - Dr. Dorough

4 December 1974 - Dr. Dinneen, Dr. Dorough, Dr. Renier, and Mr. Stuelpnagel

D. MEETINGS WITH CONCEPT TEAM FIELD REPRESENTATIVES

20 June 1974

2 July 1974

9 - 10 July 1974

25 July 1974

29 - 30 July 1974

7 August 1974

19 - 20 September 1974

21 November 1974

E. SPECIAL MEETINGS

19 June 1974 - Meeting with Dr. John Allen, Mr. Ray Thorkildsen, and COL John McCambridge, ODDR&E.

Discussion with Mr. Norman R. Augustine, ASA (R&D).

Discussion with Mr. Charles L. Poor, Dep Asst ASA (R&D).

26 July 1974 - Meeting with Foreign Science and Technology personnel on FIO role.

- Meeting with Mr. John Brinkman, ARMCOM

8 August 1974 - Meeting with Generals' Lewis, Sears, and Sterling on interfaces.

12 August 1974 - Meeting with Mr. S. Lorber, Director of Quality Assurance, AMC HQ.

26 September 1974 - Meeting with selected industry and AMC personnel.

1 October 1974 - Discussion with MG Chester M. McKeen, Director, Requirements and Procurement, AMC, HQ.

3 October 1974 - Discussion with MG Lawrence E. Von Buskirk, DARD.

8 October 1974 - Meeting with MG Erwin Graham, CG, US Army Logistics Management Center, Ft. Lee, Virginia.

14 November 1974 - Briefing to DA Staff.

F. VISITS TO AMC ARMAMENT COMMUNITY

12 June 1974 - MICOM

16 July 1974 - ARMCOM HQ and Rock Island Arsenal

17 July 1974 - Frankford Arsenal

18 July 1974 - Watervliet Arsenal

19 July 1974 - Picatinny Arsenal

23 July 1974 - Ballistic Research Laboratories

24 July 1974 - Army Materiel Systems Analysis Agency and Edgewood Arsenal

5 November 1974 - MICOM

7 November 1974 - ARMCOM HQ and Rock Island Arsenal

ANNEX II-C

FUNCTIONS TRANSFERRED

ANNEX II-C

FUNCTIONS TRANSFERRED

SECTION A: FUNCTIONS RECOMMENDED FOR ARMAMENT LOGISTIC CENTER.

1. Integrated supply and stock control, cataloging, materiel utilization and disposal for assigned materiel consistent with national inventory control point responsibilities.

2. Maintenance engineering and management, and preparation of supply publications, for the life of assigned materiel consistent with national maintenance point responsibilities.

3. Worldwide maintenance and supply technical assistance program.

4. International logistics operations for assigned materiel.

5. Logistics readiness liaison program with field commanders.

6. Sale or donation of excess or surplus items to eligible organizations.

7. Transportation and traffic management principles and factors.

8. Interservice logistics support including agreements on retail and wholesale supply and depot maintenance support to be provided or received from other services.

9. Industrial Preparedness Program and related operations, which include:

a. Production Base Support Program, including modernization and expansion, annual support, and layaway of industrial facilities, in coordination with the US Army Project Manager for munitions production base modernization and expansion.

b. Planning with industry and the government-owned industrial production base.

c. Army industrial equipment.

d. Defense Materiels Systems operations, such as assignment of defense order and direct exchange industrial priority ratings, compilation of authorized controlled materiel requirements, and processing of requests for special priorities assistance in accordance with Department of Commerce regulations.

10. Requirements for contingency plans and general/limited war reserves (CONUS and overseas); management of CONUS Obligated War Reserves for assigned items; operational projects; capability and readiness reports for war reserves as required.

11. DA licensee for and controls of the supply, maintenance, storage, use and disposal of, assigned radioactive sources.

12. Management of Army contracts with Continental United States (CONUS) land burial facilities for disposal of radioactive waste.

13. Responsibility for Operational Status Release and Hold Orders received from the Commander, DNA, for war reserve weapons deployed to/at major Army commands.

14. Responsibility for nuclear weapons logistics support plans for nuclear warhead sections, nuclear projectiles and atomic demolition munitions, and logistics support plans for other assigned materiel, as directed.

15. Suspension and restriction notices covering types and individual lots of non-nuclear and chemical munitions; suspension or restriction of individual lots or types of nuclear munitions.

16. Technical supervision over the Munitions Stockpile Realiability Program.

17. Responsibility for system of type designators ("XM" and "M") for development and adopted items of materiel for non-nuclear munitions.

18. Responsibility for demilitarization procedures for assigned commodities; control of the Chemical Demilitarization Program (including funding and technical aspects).

19. Responsibility for Alternate Files Repository and the AMC Technical Data Records Repository.

20. Acts as the CONUS Army Central Activity for the control, issue, and disposal of assigned captured enemy equipment and other foreign materiel.

21. Compiles and maintains serial number records of small arms issued to general officers, or reported as sold, destroyed, or stolen.

22. Provides photographic and audio-visual support services for defense agencies on an assigned area basis.

23. Provides Army member and chairman of Joint Conventional Ammunition

Production (JCAP) Coordinating Group; provides JCAP/CG Executive Director, Army members of JCAP Operating Group and JCAP task groups; and provides administrative and logistical support to JCAP.

24. Responsibility for the AMC Technical Escort Program currently at Edgewood Arsenal which provides technical escort services for chemical, biological, and etiological material; radiological material, and other hazardous items.

25. Responsibility for New Equipment Training.

26. Responsibility for Technical Manuals.

SECTION B: FUNCTIONS RECOMMENDED FOR TRANSFER TO ANOTHER AGENCY.

1. Operation of the DOD Plastics Technical Evaluation Center at Picatinny, which is responsible for collecting, exchanging, collating, developing, and evaluating technical data on plastic materials, adhesives and organic-matrix composites of interest to DOD.

2. Responsibility for the DA test, measurement, and diagnostic equipment program currently at Frankford Arsenal.

3. Management of the radioactive test sampling and calibration program under Edgewood Arsenal.

4. The lubricants, oils, and transmission fluids efforts currently at Frankford Arsenal.

5. The mycology (study of fungi and their deterioration effects on material) effort currently at Frankford Arsenal.

6. The propellant and cartridge actuated device effort currently at Frankford Arsenal to the Navy as single service manager.

7. Responsibility for the ultra-high pressure research currently at Watervliet Arsenal.

ANNEX II-D

ADC ORGANIZATIONAL CONCEPT

ADC ORGANIZATIONAL CONCEPT

"Reference Organization"
1-Site

Total Strength: 7500

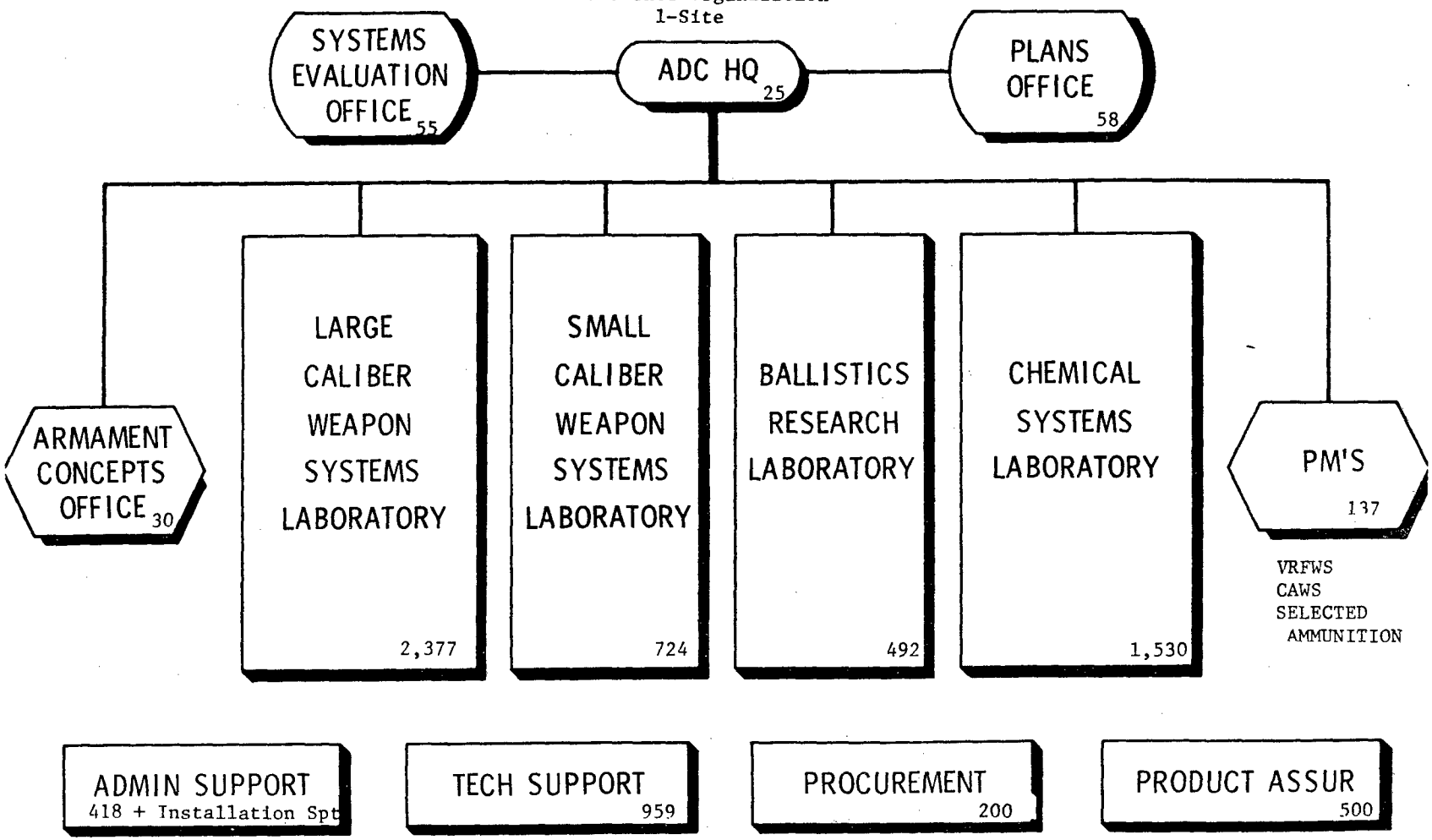


Figure II-D-1

SMALL CALIBER WEAPONS SYSTEMS LABORATORY

	PROF	TECH	ADMIN	TOTAL
Director's Office	2	2	2	6
Systems Modelling Division	38	-	4	42
Weapons Mechanisms Division	40	10	8	58
Fire Control Division	88	20	15	123
Physical Sciences Division	22	10	4	36
Small Arms Division	41	33	6	80
Automatic Cannon Division	36	32	10	78
Ammunition Division	103	21	33	157
Fuze Division	8	2	2	12
Engineering Support Division	20	0	5	25
Manufacturing Technology Div				88
Systems Development Directorate	14	2	3	19
TOTAL				724

LARGE CALIBER WEAPONS SYSTEMS LABORATORY

	PROF	TECH	ADMIN	TOTAL
Director's Office	2	2	2	6
Systems Modeling Division	48	-	5	53
Fire Control Division	105	24	13	192
Armament Application Div	139	64	26	229
Energetic Materials Div	100	20	20	140
Physical Sciences Division	48	20	8	76
Systems Development Directorate	25	2	4	31
Applied Sciences Division	96	23	11	130
Mortars & RR Division	20	15	5	40
Tank & Artillery Division	111	77	24	212
Munitions Division	430	102	111	643
Fuze Division	100	18	10	128
Nuclear Applications Div	150	75	75	300
Manufacturing Technology Div				162
Engineering Support Division	30	0	5	35
TOTAL				2377

BALLISTICS RESEARCH LABORATORY

Vulnerability-Lethality Div	85	30	15	130
Propulsion & Launch Dynamics Division	68	13	9	90
Flight Dynamics Division	80	37	15	132
Terminal Effects Division	93	35	12	140
TOTAL				492

CHEMICAL SYSTEMS LABORATORY

Bio-Medical Division				213
Chemical Division				177
Development & Engineering Div				350
Manufacturing Technology Div				225
Technical Support Division				93
Other Support				472
TOTAL				1530

Figure II-D-2

ANNEX II-E

SPECIAL STUDY REPORT
USER/DEVELOPER LINKAGE

ANNEX II-E

SPECIAL STUDY REPORT
USER/DEVELOPER LINKAGE

1. General. a. This report, covering a one-man, two-month special study effort, is a record of the activities performed, persons visited and the thinking (as of this date) which led to the conclusions and recommendations contained herein.

b. This study began on 30 September 1974 and terminated on 22 November 1974. Discussions were held with representatives, units, and individuals at HQ DA, HQ USAMC, HQ USATRADOC, USAREUR, and various service schools, see page II-E-5.

2. Purpose. The purpose of this study was to examine one of the AMARC findings -- that there is a weakness in the linkage between the user and the developer. The study objective was to determine recommendations appropriate for strengthening the user/developer link.

3. Concept. The study was initiated as a part of the ADC concept. This concept included the use of marketers to achieve a stronger link between the user and developer. For the purpose of this study, the user is defined as the individual/unit to which an item is issued. The user representative is defined as HQ TRADOC, their service schools or other designated representatives. The marketers were seen as experienced combat arms and technical service officers who would be assigned to the ADC and who would assist the developer in producing a better product for the user. The marketer's responsibility is to insure that the product of the developer best satisfies the user's needs. To do this, the marketer must insure that the user understands what is technologically available, that the developer fully understands and satisfies the user's needs, and that there is continuous interaction between user and developer during development. The marketer must interact with the user, user representative, resource allocator, contractor, other services, and foreign armament markets, as well as the ADC team with whom he is working.

4. Discussion. The ADC concept for "marketers" was used as the basis for discussions with the organizations visited. The results of visits are recorded in the trip reports. Specific topics, particularly those which indicate conflict in viewpoints, have been extracted and are reported below.

a. Required Operational Capability (ROC) Document. Major commands are requested to comment to HQ DA within 30 days on TRADOC proposed ROC's. Due to a lack of emphasis at all levels of command, and due to the press of everyday business, ROC's are rarely seen below Corps level. Thus, one of the first major actions in the development process is virtually void of user input. TRADOC has recently taken steps to increase to 45 days the time available for comments and is requesting that the comments be received at HQ TRADOC for consolidation prior to submission to HQ DA. An additional problem, not yet solved, is one associated with the turnover of user/user representative personnel. Frequently, requirements change when user personnel change. This becomes a problem for a developer who has been working against certain requirements and then receives a change of emphasis from the user community.

b. Equipment Improvement Recommendation (EIR). It was agreed by all persons visited that the EIR process is cumbersome, requires too much detail and is not responsive to the user's needs. This is unfortunate since this process represents a major key to any marketing concept--feedback. In FY 74, only 3% of the PIP program involved the correction of deficiencies. Users indicated that replys to EIR's are rarely received. When a reply is received the extent of the additional information requested is such that the user, due to a perceived lack of time, frequently decides to drop the matter. It is apparent that the developer is not sufficiently involved (pulling) and that TRADOC (as the user's representative) is not pushing the unit or developer.

c. The Armaments Package. Timely development and issue of the entire package associated with the issue of new armaments is critical to all receiving organizations. This package includes manuals, test equipment and training (to include training devices). Manuals are generally too complex for the soldier to understand (with the exception of the "-10" on the M109A1 Howitzer). The manuals are not organized for easy use. (For example, operator checks are located by chapter rather than consolidated.) CATB, under TRADOC, has been addressing this problem. The development of training devices frequently does not parallel or lead development of the actual system. TRADOC and AMC have recently taken steps to correct these difficulties with the establishment of the TRADOC TRADER office and the AMC PM, TRADE office.

d. Reliability, Availability and Maintainability (RAM). RAM requirements need to be considered in light of the "Keep it Simple" principle. The long hours spent in the maintenance shops and motor pools and the availability rates indicate that:

Equipment is too sophisticated for today's soldier (i.e., the gap between the state-of-the-art and soldier's intelligence is widening).

RAM requirements as stated in the ROC are often not attainable in the field.

Sufficient trained maintenance personnel are not available.

The combination of the above and their side effects (e.g., substitution of a soldier with a 11B MOS for a trained mechanic) are a certain guarantee of poor maintenance, frustrated troops and commanders, and a resultant loss of effective combat strength. Perhaps part of this problem is that RAM requirements are established without due consideration of the fact that most combat units rarely have the authorized level of maintenance personnel, thus, degrading the level of maintenance desired. It would appear that testing during the development phase must be done under the actual user (field) situation. This would be further justification for innovative testing in user units in an attempt to identify RAM problems early in the development phase.

e. 6.2 and 6.3A Programs. The service schools visited, speaking as user representatives, do not feel they have sufficient influence over the developmental work performed in 6.2 and 6.3A. Cases were cited where work was on-going in an area for which a service school was the proponent and yet the service school did not know about the effort. The opportunity for this to occur has increased with the initiation of Single Program Element Funding (SPEF). The developers (AMC) feel the Lab Director and his technically qualified personnel are the best judges of those efforts in 6.2 and 6.3A which will produce technological advances. This problem has been partially addressed with the recent MOU between TRADOC and AMC which provides for a better flow of information between the lab and the service school. The impact of this has not yet hit the schools. Additionally, the user/user representative still has no vote, only comment, on how funds are spent. The first time the user is represented in the funding process is at HQ DA by ODCSOPS.

f. The Marketer Concept. All persons visited agreed with the marketer concept. The user, whose interface with the developer has been minimal, was highly enthusiastic with the opportunity to become involved in the developmental process. The user representatives expressed concern over the possibility that the marketers would get lost in the AMC shuffle, lose their identify with the user, overlap the user representative functions and have no voice to the ADC commander, thus accomplishing little more than is now available.

The service schools feel the marketers should be assigned to them to prevent the above from occuring. The TRADOC Commander has stated such an arrangement would not be acceptable. In an attempt to correct the above concerns, the marketer concept has been altered to provide for the marketers to report to a deputy to the ADC Commander. This would allow for the marketers' views to be heard by the commander of the ADC. This appears to be an area for future surveillance. To achieve credibility with the user, the contributions of the marketers cannot be cut off at the team leader level. Results must reflect user input where appropriate. At the Artillery Systems Review, 24 October 1974, General DuPuy reiterated his feeling that TRADOC does not have enough technically qualified people to make good judgments on weapons.

5. Conclusions. a. The concept for "marketers" in the ADC is sound.

b. The user desires to become more involved in the development of armaments. He is willing to accept unstructured, informal prototype testing consistent with the unit mission. He would like a greater degree of influence over the 6.2 and 6.3A work.

c. The user representative community views the involvement by the user in the development process with concern. The user representatives feel that they, due to their orientation and background, are the best personnel to articulate requirements.

d. A major effort to improve the EIR process is needed. The user feels that the developer washes his hands of an item once it is fielded. There is a great deal of frustration evidenced due to this problem.

e. Continuous coordination with the training device side of the house is required. Offices are now established which should facilitate this interface with the ADC.

f. The establishment of the RAM requirements procedure needs study. This complex subject cannot be properly addressed in this study.

g. Although the MOU between TRADOC and AMC will assist in the passing of information on 6.1, 6.2 and 6.3A efforts and user needs, it does not solve all of the stated desires. The alignment between TRADOC and AMC might be improved by including a TRADOC voting member (General Officer) on the AMC Review Board for RDTE funding.

h. The marketer must have a voice from the user/user representative to the ADC commander. The marketer cannot be cut off at the team leader level.

1 Incl
as

PERSONS AND ORGANIZATIONS VISITED

MG GIBSON	DCSLOG HQ USAREUR
MG BURTON	CMDR, 3d Armored Div
MG MEYER	CMDR, 3d Infantry Div
COL MILLER	Ch, Mat & Readiness Div, ODCSLOG, USAREUR
COL MARTIN	Ch, Doc Sys & Tng Div, ODCSOPS, USAREUR
COL KEELEY	CMDR, 2d Bde, 3d Armored Div
COL BROPHY	CMDR, 3d Bde, 3d Infantry Div
LTC ATWOOD	XO, 2d Bde, 3d Armored Div
LTC BREEDLOVE	CMDR, 2/6 FA, 3d Armored Div
LTC ASHWORTH	TRADOC LNO, HQ USAREUR
LTC MAHLER	CMDR, 3/12 Cav, 3d AD
LTC HRUBY	CMDR, 1/33 Armor, 3d AD
LTC MITCHELL	CMDR, 3/61 ADA, 3d AD
LTC HOUSER	G4, 3d AD
LTC MILLER	Dep G4, V Corps
LTC DURHAM	G4, 3d Inf, Div
LTC O'NEIL	G3, 3d Inf Div
LTC TURNER	CMDR, 1/4 Inf, 3d Inf Div
LTC CUMMINS	CMDR, 1/7 Inf, 3d Inf Div
LTC MOSCATELLI	CMDR, 4/64 Armor, 3d Inf Div
MAJ HAMON	S4, 3d Bde, 3d Inf Div
MAJ CHITTENDEN	S3, 3d Bde, 3d Inf Div
CPT COLWELL	CMDR, E-122 Maint, 3d ID
CPT PULLIAM	S4, 2d Bde, 3d AD
CPT GREEN	CMDR, Cbt Spt Co. 1/4 Inf, 3d ID
CPT MIESNER	CMDR, Co C, 1/4 Inf, 3d ID
CPT BOYLE	CMDR, Co B, 1/4 Inf, 3d ID

Plus various maintenance personnel, armorers and individual soldiers.

COL LANGFORD AND STAFF	Ch, Wpn Div, Cbt Tng Dev, Dir Ft. Sill, OK
MG STARRY	CMDR, Ft. Knox, KY
COL DAVIS	Ch, Cbt Dev Dir, Ft. Knox, KY
MG TARPLEY	CMDR, Ft. Benning, GA
COL HATCH	Ch, Cbt Dev Dir, Ft. Benning, GA
COL ODDI	Ch, Mat Sys Div, Ft. Benning, GA
COL HART	CMDR, USACATB, Ft. Benning, GA
COL QUEDENS	Ch, TRADER (Training Device Requirements), Ft. Benning, GA
MR. J. HARRIS	Programs Management Div, Cbt Dev Dir, HQ TRADOC, Ft Monroe, VA

ANNEX II-F

ADC SITE SURVEY REPORT

ANNEX II-F

ADC SITE SURVEY REPORT

1. General. The AMARC recommended that a new Armament Development Center be created at a single location through an evolutionary process, by consolidating selected elements of Frankford, Picatinny, Rock Island, and Watervliet Arsenal RD&E activities together with the Ballistics Research Laboratory and portions of the ARMCOM RD&E Directorate, and that the Edgewood Arsenal RD&E missions be incorporated without relocation.

2. Ideal Site. The ideal site necessarily will entail certain trade offs to obtain the desired characteristics. The site would have sufficient real estate to accommodate the Armament Development Center research and development mission with long range expansion capabilities. This site would provide all test ranges, laboratories and test facilities, and supporting technical facilities such as machine shops and model shops. Utilities would be readily available and the site would be reasonably accessible by road, air and rail service. Climatic conditions should enhance maximum availability of all facilities for the ADC mission. It would be sufficiently remote that environmental and urban encroachment problems would be precluded in the long range. However, homes, churches, schools and shopping facilities should be within a one-hour drive, and a large metropolitan area with its attendant facilities should be easily accessible.

3. Methodology. a. Due to the Close Hold nature of the study, sources of candidate sites could not be circularized in the normal manner. Instead a list of sites suggested by personal interviews was prepared. The list was reviewed for completeness by personnel with general knowledge of government installations. All AMC installations were considered in coordination with the AMC Installations and Services Directorate. Likely DoD sites were obtained through the Offices of the Assistant Secretaries (Installations and Logistics) of Defense, Army, Navy, and Air Force, and Service contacts suggested by these sources. Appropriate staff agencies of the National Aeronautics and Space Administration and the Atomic Energy Commission were also contacted. A listing of possible suitable sites which have been declared excess was obtained from the General Services Administration. Those sites and installations which appeared to have the characteristics necessary for the ADC were visited. Consideration of sites requiring significant real estate acquisition was abandoned early as it was felt that Congressional approval would be extremely unlikely while DoD installations are being closed.

b. Broad criteria were developed for evaluating and comparing candidate sites. These criteria include the physical characteristics of the site, the attractiveness of the location and community, and

environmental and cost considerations. To preclude consideration of obviously unsuitable sites, the criteria for a new single site required sufficient real estate to provide collocation of all testing facilities required by the ADC including long range weapons. The facility requirements under two-site and three-site alternatives were also identified as trade-offs to minimize personnel actions and reduce construction. The criteria are:

PHYSICAL

land area; adjacent population density; encroachment pressure

useable buildings and utilities

long term water, fuel and power supplies

access by road, rail, air and water

proximity to other armament activities

COMMUNITY

availability of and climate for professional personnel

availability of nonprofessional work force

local housing, schools, cultural assets

proximity to academic institutions and industrial research

POLITICAL

support from Congressional delegation - selected area

opposition due to reductions and closures

ENVIRONMENTAL IMPACT

COSTS

new construction & alteration

construction cost index

personnel and equipment relocation

extraneous base operations

c. Most candidate sites were eliminated by consultation with knowledgeable personnel and examination of descriptive reports. The sites considered are listed below and are coded as follows: *Potential ADC site; **Current mission not compatible with ADC mission; *** Does not meet ADC criteria.

INSTALLATIONS CONSIDERED FOR THE ADC

1.	Aberdeen Proving Ground, Maryland	*
2.	Aeronautical Depot Maintenance Center, Texas	***
3.	Albany Naval Air Station, Georgia	***
4.	Alabama Army Ammo Plant, Alabama	***
5.	Anniston Army Depot, Alabama	***
6.	Army Materials & Mechanics Research Center, Massachusetts	***
7.	Arnold Engineering Development Center, Tennessee	***
8.	Atlanta Army Depot, Georgia	***
9.	Badger Army Ammo Depot, Wisconsin	**
10.	Beale AFB, California	***
11.	Fort Belvoir, Virginia	***
12.	Fort Benning, Georgia	**
13.	Fort Bliss, Texas	**
14.	Burlington Army Ammo Plant, New Jersey	***
15.	Charleston Army Depot, South Carolina	***
16.	Cornhusker Army Ammo Plant, Nebraska	**
17.	Detroit Arsenal, Michigan	**
18.	Fort Devens, Massachusetts	**
19.	Fort Dix, New Jersey	**
20.	Dugway Proving Ground, Utah	*
21.	Harry Diamond Laboratories, Maryland	***
22.	Edgewood Arsenal, Maryland	*
23.	Edwards AFB, California	**
24.	Eglin AFB, Florida	**
25.	Fort Eustis, Virginia	**
26.	Frankford Arsenal, Pennsylvania	*
27.	Gateway Army Ammo Plant, Missouri	***
28.	Glynco Naval Air Station, Georgia	***
29.	Gruman Plant Activity, Florida	***
30.	Hays Army Ammo Plant, Pennsylvania	***
31.	Camp A. P. Hill, Virginia	**
32.	Holloman AFB, New Mexico	***
33.	Holston Army Ammo Plant, Tennessee	**
34.	Hunter Liggett Military Reservation, California	**

35.	Indiana Army Ammo Plant, Indiana	**
36.	Iowa Army Ammo Plant, Iowa	**
37.	Fort Irwin, California	*
38.	Jefferson Proving Ground, Indiana	*
39.	Joliet Army Ammo Plant, Illinois	**
40.	Kansas Army Ammo Plant, Kansas	**
41.	Keweenaw Field Station, Michigan	***
42.	Kirtland AFB, New Mexico	**
43.	Laguna Niguel, California	*
44.	Lake City Army Ammo Plant, Missiouri	***
45.	Laredo AFB, Texas	***
46.	Lawndale Army Msl. Plant, California	***
47.	Letterkenny Army Depot, Pennsylvania	**
48.	Lexington-Blue Grass Army Depot, Kentucky	***
49.	Fort Lee, Virginia	**
50.	Lone Star Army Ammo Plant, Texas	**
51.	Longhorn Army Ammo Plant, Texas	**
52.	Louisiana Army Ammo Plant, Louisiana	**
53.	Marshall Space Flight Center, Alabama	***
54.	Michigan Army Missile Plant, Michigan	***
55.	Milan Army Ammo Plant, Tennessee	**
56.	Mississippi Test Facility, Mississippi	***
57.	Fort Monmouth, New Jersey	**
58.	Natick Laboratories, Massachusetts	***
59.	Navajo Depot Activity, Arizona	**
60.	New Cumberland Army Depot, Pennsylvania	***
61.	Newport Army Ammo Plant, Indiana	**
62.	Otis AFB, Massachusetts	***
63.	Pantex Ordnance Plant, Texas	***
64.	Phosphate Development Works, Alabama	***
65.	Picatinny Arsenal, New Jersey	*
66.	Pine Bluff Arsenal, Arkansas	***
67.	Plum Brook Station, Ohio	*
68.	Pueblo Army Depot, Colorado	***
69.	Radford Army Ammo Plant, Virginia	**
70.	Ravenna Army Ammo Plant, Ohio	**
71.	Red River Army Depot, Texas	**
72.	Redstone Arsenal, Alabama	***
73.	Riverbank Army Ammo Plant, California	***
74.	Rock Island Arsenal, Illinois	*
75.	Rocky Mountain Arsenal, Colorado	*
76.	Sacramento Army Depot, California	***
77.	Saginaw Army Aircraft Plant, Texas	***
78.	St. Louis Area Support Center, Illinois	***
79.	Savanna Army Depot, Illinois	***
80.	Scranton Army Ammo Plant, Illinois	***
81.	Seneca Army Depot, New York	**
82.	Sharpe Army Depot, California	***
83.	Sierra Army Depot, California	**

84.	Sunflower Army Ammo Plant, Kansas	**
85.	Tarheel Army Missile Plant, North Carolina	***
86.	Tobyhanna Army Depot, Pennsylvania	**
87.	Tooele Army Depot, Utah	**
88.	Twin Cities Army Ammo Plant, Minnesota	***
89.	Tyndall AFB, Florida	***
90.	Umatilla Depot Activity, Oregon	***
91.	Volunteer Army Ammo Plant, Tennessee	**
92.	Watervliet Arsenal, New York	*
93.	White Sands Missile Range, New Mexico	**
94.	Yuma Proving Ground, Arizona	*

4. Description of Current and Potential Sites. a. The five primary sites at which armament R&D is currently conducted are discussed below.

(1) Frankford Arsenal is unsuitable as a single site for the ADC due to its size (110 acres), its location inside Philadelphia, and lack of modern structures. The closure of this arsenal was recommended in the CONCISE study. The City of Philadelphia by 29 November 1974 letter to the President offered to provide 150 acres of land to accommodate the current arsenal activities of these activities plus remaining small caliber armament activities. Construction of facilities would be funded through a bond issue with debt service covered by annual lease payments. Up to 800 acres of additional land could be made available if a decision were reached to consolidate all ADC activities there, other than Edgewood Arsenal and the ranges at Aberdeen Proving Ground. Although considered, the offer does not provide sufficient land area for these ADC activities. Further, environmental and urban encroachment problems woud preclude development testing at the proposed location. Both Frankford Arsenal and the real estate offered are considered as a partial site for selected activities of the ADC.

(2) Watervliet Arsenal is also too small for use as a single site (147 acres), and is surrounded by built-up area. The closure of Benet Laboratory at this arsenal was recommended in the CONCISE study.

(3) Rock Island Arsenal is larger (908 acres); but its location on an island closely surrounded by urban areas, and its lack of unused structures and space militate against its selection as the ADC single site. If a portion of the ADC were to be located at Rock Island, most of the required unique facilities would have to be provided by construction or conversion of existing buildings.

(4) Picatinny Arsenal is a feasible site for the ADC with the exception of sufficient land area for long range weapons testing. The arsenal occupies over 6,000 acres, and includes 260,000 square feet

administrative, 804,000 square feet laboratory, and 785,000 square feet supporting shop space. There would be no significant impact on implementation scheduling due to administrative space: but laboratory and shop space would be new or would require alteration. New construction would be required for unique facilities, and alteration of existing buildings would provide the remaining facilities. The relative abundance of existing floor space is in a sense a disadvantage of PA as an ADC site in that properly designed new construction would be more attractive and efficient. The arsenal is readily accessible to the Interstate Highway. Within a commuting radius of one hour are many small towns and industrial activities.

(5) Of the five primary sites, Aberdeen Proving Ground is the most attractive as a single ADC site, especially if the Ordnance Center and School (OC&S) is relocated as recommended in the CONCISE study and assumed in this analysis, for all alternatives in which the population at Aberdeen is increased. The Aberdeen and Edgewood peninsulas occupy over 40,000 acres, and the reservation boundary includes about an equal area of water. The following floor space would be available: Ballistic Research Laboratory; 143,000 square feet administrative, 528,000 square feet laboratory, and 17,000 square feet shop; Ordnance Center and School, 112,600 square feet administrative, negligible laboratory, and 915,000 square feet shop. With internal relocation of the various tennant activities at the installation, the existing facilities, with appropriate alternatives, will accommodate the ADC. New construction would be required for the additional unique test facilities. The disadvantage of existing floor space applies at APG, but to a lesser degree than at PA. The ADC would still be forced into a less than optimum configuration, making extensive use of facilities designed for other purposes. Urban encroachment and environmental considerations will probably become a serious factor ultimately limiting, if not precluding, future extensive test firing activities.

b. A new location which can compete with either Picatinny Arsenal or Aberdeen Proving Ground on a cost basis almost certainly does not exist; but some sites are much more attractive than either of these when evaluated by the criteria. Evaluation of candidate fresh sites follow.

(1) Plum Brook Station, a NASA facility and the former Plum Brook Ordnance Works, is located near Lake Erie 55 miles west of Cleveland. The station includes 5600 acres inclosed by fencing, and approximately 2000 acres of government-owned buffer zone. The station is operated as a satellite of NASA's Lewis Research Center in Cleveland, but it is almost entirely in a standby status at present. NASA personnel have tentatively indicated that most of the land area and significant facilities in excellent condition could be made available (approximately 125,000 square feet of administrative space,

20,000 square feet laboratory, and 100,000 square feet shop). The physical and community aspects of this site are very attractive. With the exception of administrative personnel and perhaps 200 professional and technical support personnel, relocation to Plum Brook would be delayed until new facilities could be made available, beginning in late CY 1978 and programmed over several additional years. The principal advantage of Plum Brook and similar sites, other than the attractiveness of the community and area, is the opportunity for a fresh start. The facilities can be designed to meet precisely the ADC requirements. These facilities would be less expensive to operate and maintain, and should have a significant effect on the quality of personnel recruited and ultimately on the quantity and quality of ADC output. Long range firing tests would have to be conducted elsewhere.

(2) A very attractive GSA facility which would be used as a partial site with Yuma Proving Ground or Ft Irwin is the Laguna Niguel Facility, a seven story building completed in 1971 by North American Rockwell on 92 acres. It is located approximately sixty miles southeast of Los Angeles, California about three miles off of Interstate 5 in a residential area with many large shopping centers, schools and churches nearby. The ocean is within four miles and the climate is ideal. The building contains about 800,000 square feet of net usable space consisting of administrative, manufacturing, engineering, dining and storage. Approximately 80% of the space is for engineering and manufacturing. The building is fully air-conditioned except for the storage space. Adjacent to the building is a 6,200 car parking lot.

(3) Yuma Proving Ground is located 25 miles northeast of the City of Yuma, Arizona. Phoenix is approximately 190 miles northeast. Yuma International Airport is 18 miles south of the Proving Ground with daily flights making connections with major airlines at Phoenix and Los Angeles. The Proving Ground consists of over one million acres and is being developed for the performance of all long range artillery testing. Facilities being developed for the purpose of long range artillery testing will also increase its capability to accept other munitions and weapons testing. Electricity is obtained from the Bureau of Reclamation-owned Gila Substation near Yuma and is transmitted to the Proving Ground through a 25 mile Army-owned 24.5 KV line. Water is supplied from 9 wells, and steam from a central heating plant. Currently the Proving Ground has 160,000 square feet of maintenance & production facilities, 170,000 square feet of R&D, 119,000 square feet of storage, and 76,000 square feet of administrative space. A possibility of avoiding construction of more than one half of the required ADC space is to use the vacant government-owned Laguna Niguel facility 180 miles west on Interstate 8 from Yuma.

(4) Dugway Proving Ground is located in the west central part of Utah 87 miles southwest of Salt Lake City by Interstate 80 at Timpie Junction, 37 miles north of Dugway. The distance to the Salt Lake City Airport is 77 miles. The Proving Ground consists of approxmately 841,000 acres in an isolated area. Electricity is furnished by the Utah Power and Light Company. Steam heat is provided by 3 central steam plants and all water is obtained from wells. The Proving Ground has 151,800 square feet of maintenance and production facilities, 192,000 square feet of R&D, 162,000 square feet of storage, and 130,000 square feet of administrative space. The isolated location of the installation is further compounded during the winter months when roads become impassable or closed due to severe snowfall and drifts. Furthermore there is no community of any size between the installation and Salt Lake City.

(5) Rocky Mountain Arsenal is located adjacent to the northeast edge of the City of Denver, Colorado. The Arsenal is situated on approximately 17,800 acres of flat to gently rolling prairie land. The Arsenal has its own electrical and steam generating plant. At present the generating plant capacity exceeds the arsenal demand. Both potable and industrial water is purchased from the City of Denver although industrial water is primarily drawn from the South Platte River. The sewage disposal plant is capable of handling all foreseeable needs. The arsenal has approximately 937,000+ square feet of manufacturing and assembly space, 71,800 square feet of administrative and office space, and over 800,000 square feet of storage space. Urban encroachment and environmental considerations will probably limit if not preclude test firing activities. Additionally, there is insufficient space for long range test firing.

(6) Jefferson Proving Ground is located in southeastern Indiana, 9 miles north of Madison. Louisville, Kentucky is 45 miles southwest, Cincinnati, Ohio is 75 miles northeast, and Indianapolis is 85 miles north. The Proving Ground consists of 56,000 acres entirely enclosed by chain-link fence. The Louisville Airport is 55 miles southwest on US High 491. The Proving Ground has 182,495 square feet of maintenance and production facilities, 66,000 square feet of R&D, 86,000 square feet of storage and 64,435 square feet of administrative space. Sixteen miles of railroad track connects with the Penn Central Railroad. The Proving Ground is TECOM's most efficient facility for the acceptance testing of production ammunition and possesses the only facilities to qualitatively and quantitatively test production ammunition at wartime production levels. The Proving Ground is not subject to encroachment, but its range is not expandable. The Proving Ground has the advantages of the ranges and is centrally located. Most facilities for the ADC would have to be constructed.

(7) Fort Irwin, a site in southern California, consists of over 600,000 acres of army-owned real estate which would be sufficient for building the required laboratories, supporting shops and test ranges for firing all size weapons. The site is located in the high desert with typical low humidity and rainfall with temperatures ranging from a high of 103^{o} cooling to 75^{o} at night in the summer to a low of 40^{o} in the winter. Community support is fair, with the nearest town (Barstow) being 35 miles from the site center. Barstow has a population of about 18,000 with unlimited potential for growth. The site now contains relatively new community support facilities such as 506 family quarters, commissary, post exchange, auditorium, theater, swimming pools, golf course, BOQ's, barracks, clubs and messes, bowling alley, hospital, etc. An elementary school is on the site with high schools available in Barstow. Numerous colleges and universities are located within a radium of 80 to about 150 miles from Barstow, served by interstate highways. Recreational facilities are within a 150 mile radius also easily accessible by interstate highway. The local labor market is limited, but a professional and technical labor market exists within a 150 mile radius with a population of over 5 million. Commercial trucking is available to the site. Rail service is available at Barstow. The closest major commercial air facilities, Los Angeles, are available about 150 miles by freeway from the installation. Large military aircraft (C-130) can land at the site. Utilities such as electricity, water and sewage are available on site. The water supply would have to be augmented by building a ten mile pipeline to provide an adequate supply. Gas is not now available, but can be made available by installation, by the local utilities (PG&E), of a pipeline from Barstow. Although firing ranges are available with sufficient distances, range instrumentation and range communications would have to be installed. There are no problems insofar as air, water, noise pollution, urban encroachment and air space limitations are concerned. The site is in reasonable proximity to other army and defense research, development and test activities. New construction would be required for laboratories and supporting shops. The permanent barracks could be converted to supply some of the needed administrative spaces, with new construction providing the shortfall. Other support facilities such as warehouses, ammunition storage, etc., are available.

5. Discussion. Final site selection must be based on a detailed comparison of the best new location and present armament installations. This comparison should be based on the above criteria and on the conceptual and operational considerations. The following general considerations apply.

a. Preliminary cost estimates support the intuitive conclusion that either the two-site alternative placing the ADC at APG and PA or

the three-site alternative placing the ADC at APG, PA and RIA or FA is the most direct and inexpensive approach to establishing an ADC in the short range. Personnel and equipment relocation costs, as well as construction costs, are lowest for these alternatives. The major expense of relocating or duplicating unique test facilities would also be minimized by these alternatives.

b. If the operational advantages of a single ADC site are considered sufficient to warrant additional expense, both PA and APG are suitable sites, limited by the probable short-term availability of long range weapons testing facilities at APG and non-availability of long range weapons testing facilities at PA.

c. Selection of a single site other than PA or APG may be dictated by the strength of unquantifiable benefits such as the opportunity to make a fresh start, to move to an attractive location, and to acquire first class facilities, all conducive to innovative thinking, high morale, and R&D productivity. The long range value of such benefits may outweigh temporary personnel turbulence and interruption of operational continuity, as well as higher costs. Totally new basic facilities would be constructed.

d. Site analysis of potential new sites and various alternatives suggest the serious consideration of selection of Fort Irwin as the single site. Although the initial costs will be higher, the advantages over the long range may more than offset all disadvantages. The ADC could be carefully planned and implemented, and would be a true permanent single site activity. Facilities would be designed to achieve maximum efficiency and effectiveness, and operating costs would be less than for other alternatives.

e. Another single site location for the ADC is the Yuma Proving Ground. The principal disadvantage of the Proving Ground is that most, if not all, of the laboratory, shop and administrative facilities required for the ADC would have to be constructed as the existing facilities are fully utilized by other activities. Additionally the months of July, August, and September are extremely hot with temperature ranges in excess of 100 degrees. The city of Yuma has a population of over 31,000 with two public high schools and fourteen public elementary schools and a junior college. The city has become quite a winter resort center and has forty-two modern motels with 1600 units.

f. An alternative to the single site selection of Fort Irwin or Yuma Proving Ground is that of utilizing the Laguna Niguel facility near the Pacific coast for selected laboratories, administration and the headquarters, and placing the ranges at Yuma Proving Ground or Fort Irwin. This would require some construction of facilities at the Proving Ground or Fort Irwin. Since the Laguna Niguel has two

heliports - one at ground level and one at the top of the building - travel to Yuma, approximately 195 air miles, or to Fort Irwin, approximately 135 miles, should not be a significant disadvantage. The principal advantages of the Fort Irwin alternative are that costs would be reduced and that the ADC would be the sole user.

g. A similar alternative is the dual use of the Plum Brook in conjunction with Yuma Proving Ground. This alternative would require new facilities and small arm ranges at Plum Brook, with long range testing at Yuma.

ANNEX II-G

ADC ORGANIZATIONAL CONCEPT

ADC ORGANIZATIONAL CONCEPT

1-Site
6400 Model

Alternatives 2,3,3A
Total Strength: 6386

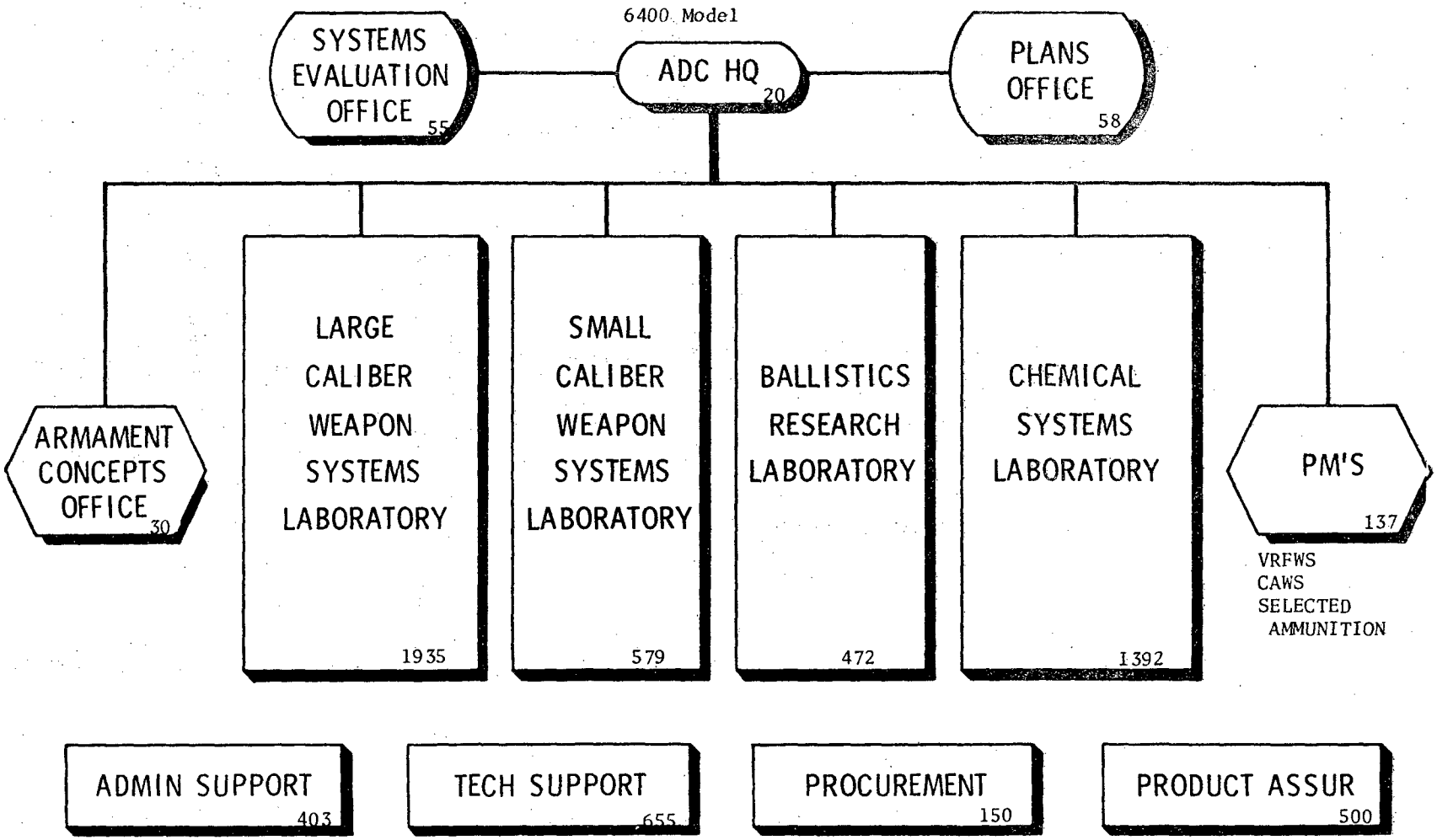


Figure II-G-1

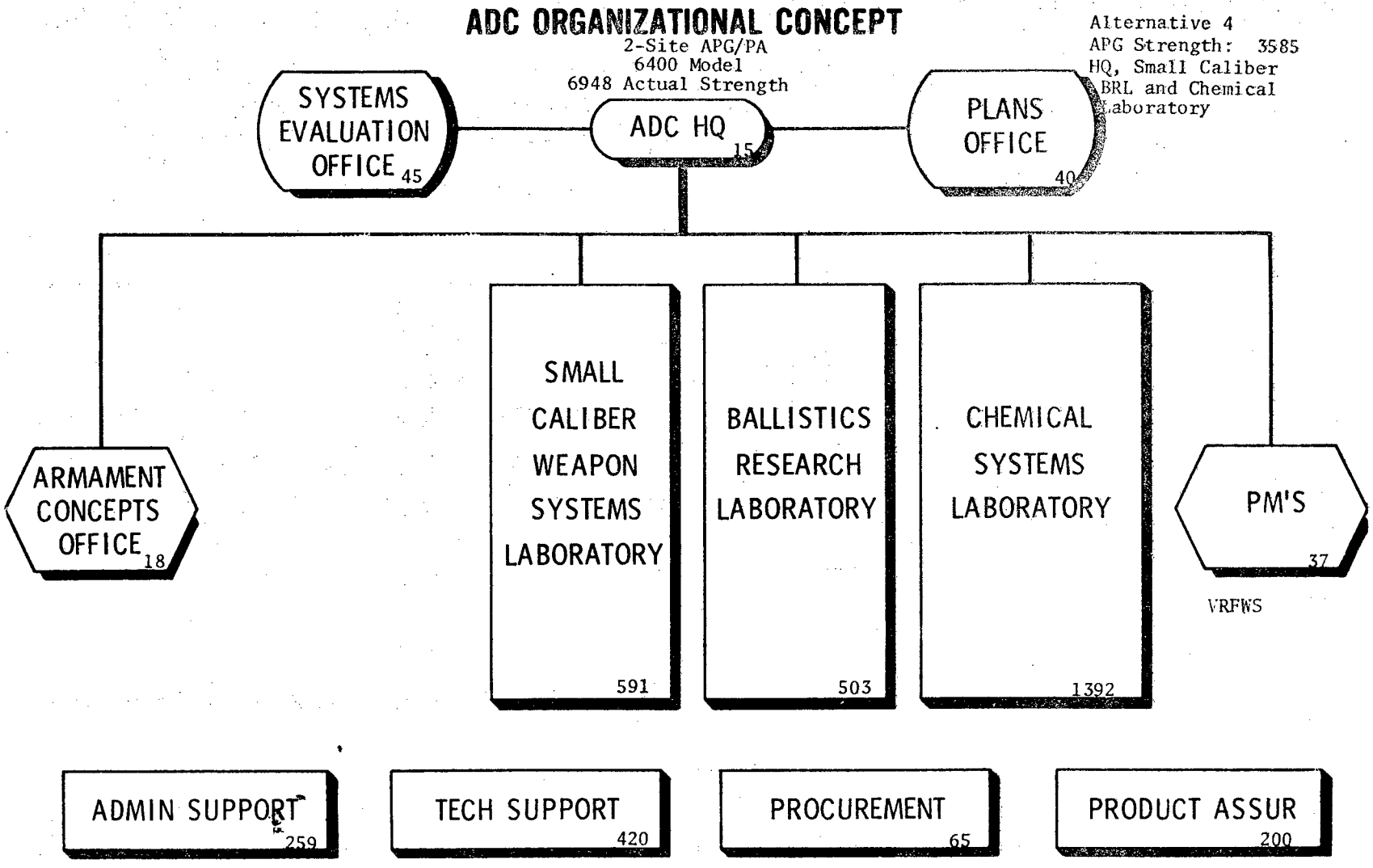
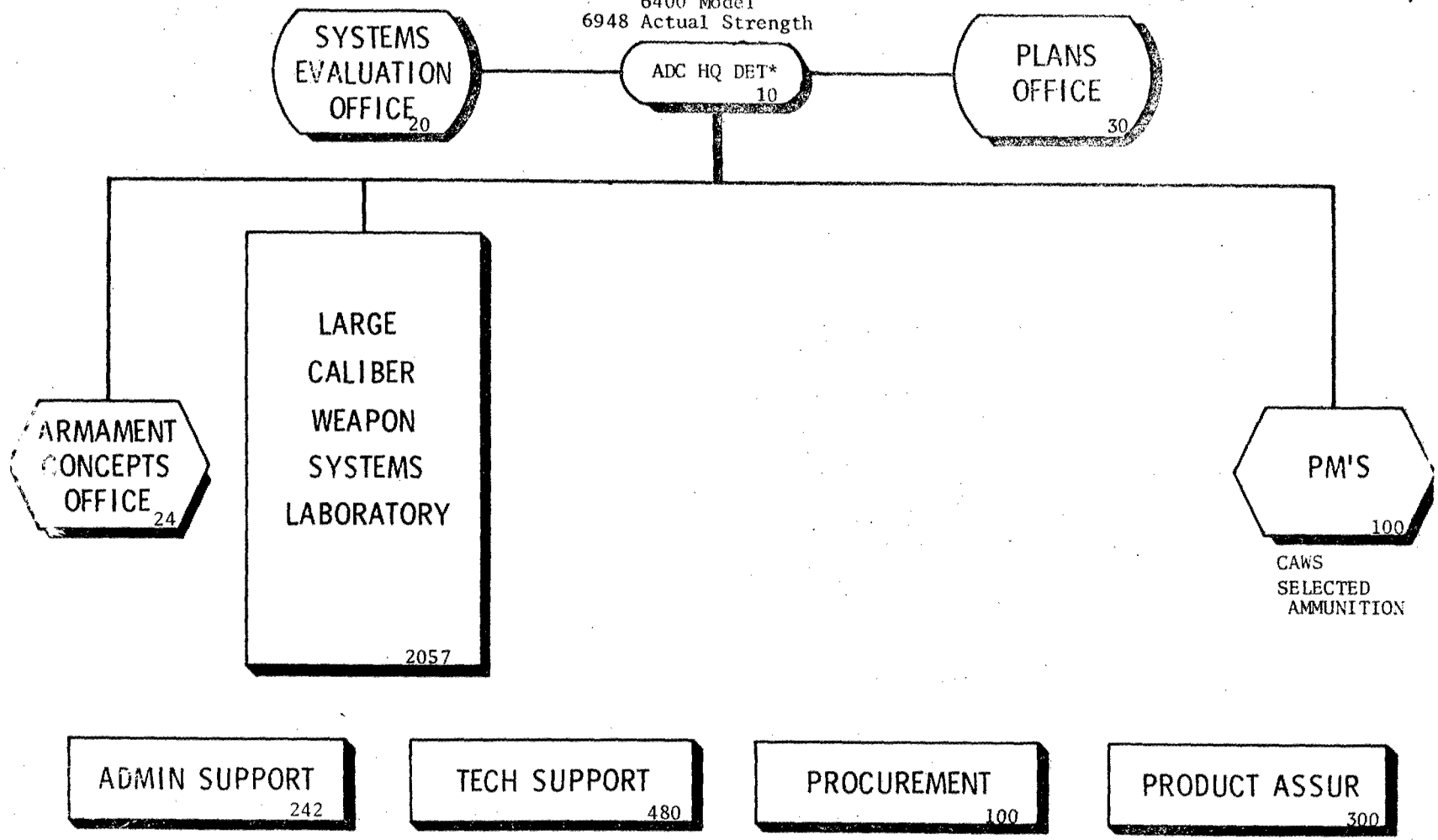

ADC ORGANIZATIONAL CONCEPT
2-Site APG/PA
6400 Model
6948 Actual Strength
Alternative 4
APG Strength: 3585
HQ, Small Caliber
BRL and Chemical
Laboratory
SYSTEMS EVALUATION OFFICE 45
ADC HQ 15
PLANS OFFICE 40
ARMAMENT CONCEPTS OFFICE 18
SMALL CALIBER WEAPON SYSTEMS LABORATORY 591
BALLISTICS RESEARCH LABORATORY 503
CHEMICAL SYSTEMS LABORATORY 1392
PM'S 37
VRFWS
ADMIN SUPPORT 259
TECH SUPPORT 420
PROCUREMENT 65
PRODUCT ASSUR 200

Figure II-G-2

ADC ORGANIZATIONAL CONCEPT

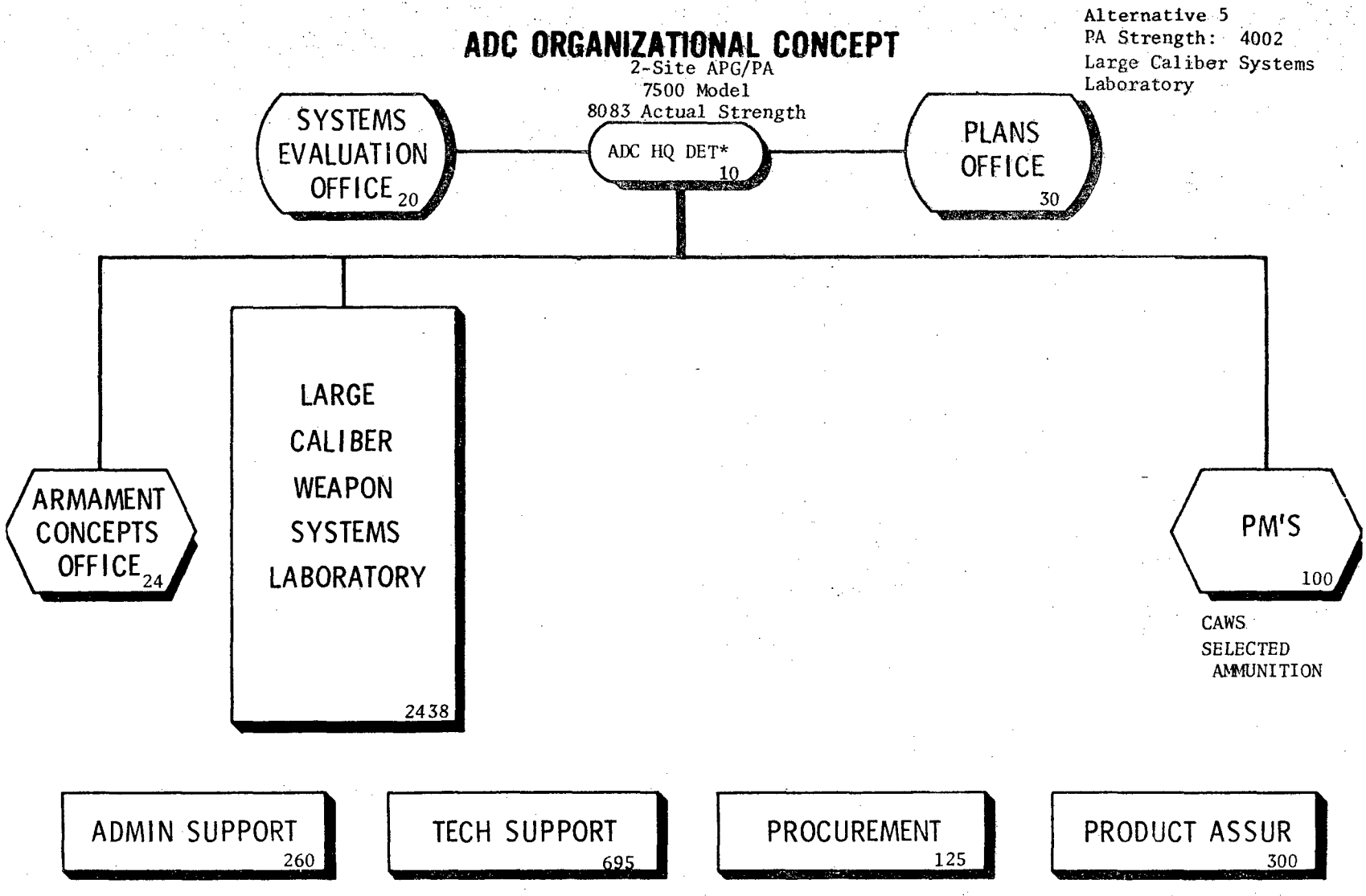
2-Site APG/PA
6400 Model
6948 Actual Strength

Alternative 4
PA Strength: 3363
Large Caliber Laboratory



*Headquarters Detachment

Figure II-G-3



*Headquarters detachment

Figure II-G-4

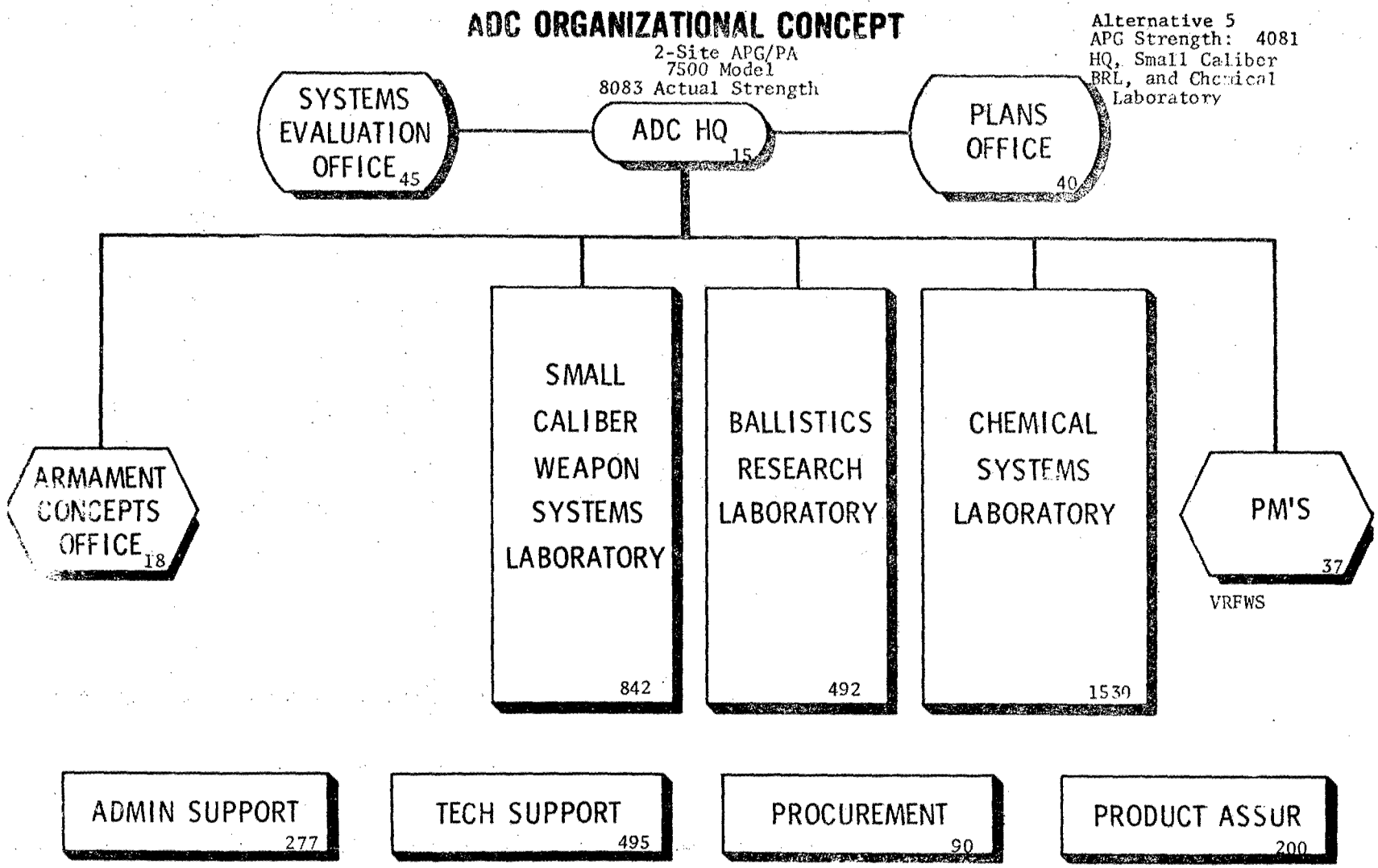
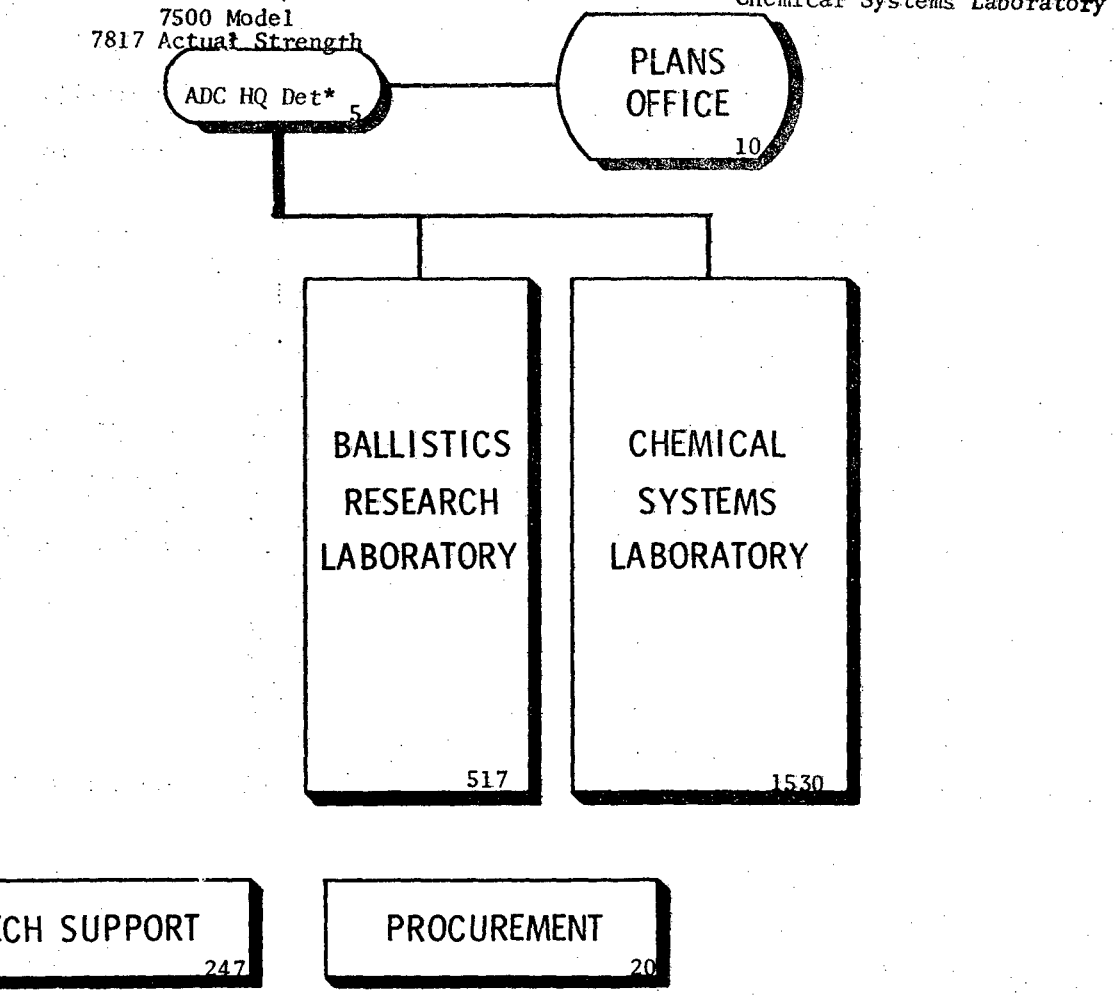

ADC ORGANIZATIONAL CONCEPT
2-Site APG/PA
7500 Model
8083 Actual Strength
Alternative 5
APG Strength: 4081
HQ, Small Caliber
BRL, and Chemical
Laboratory
SYSTEMS EVALUATION OFFICE 45
ADC HQ 15
PLANS OFFICE 40
ARMAMENT CONCEPTS OFFICE 18
SMALL CALIBER WEAPON SYSTEMS LABORATORY 842
BALLISTICS RESEARCH LABORATORY 492
CHEMICAL SYSTEMS LABORATORY 1530
PM'S 37
VRFWS
ADMIN SUPPORT 277
TECH SUPPORT 495
PROCUREMENT 90
PRODUCT ASSUR 200

Figure II-G-5

ADC ORGANIZATIONAL CONCEPT

2-Site APG/PA
7500 Model
7817 Actual Strength

Alternative 5A
APG Strength: 2402
Ballistics Research and
Chemical Systems Laboratory



* Headquarters Detachment

Figure II-G-6

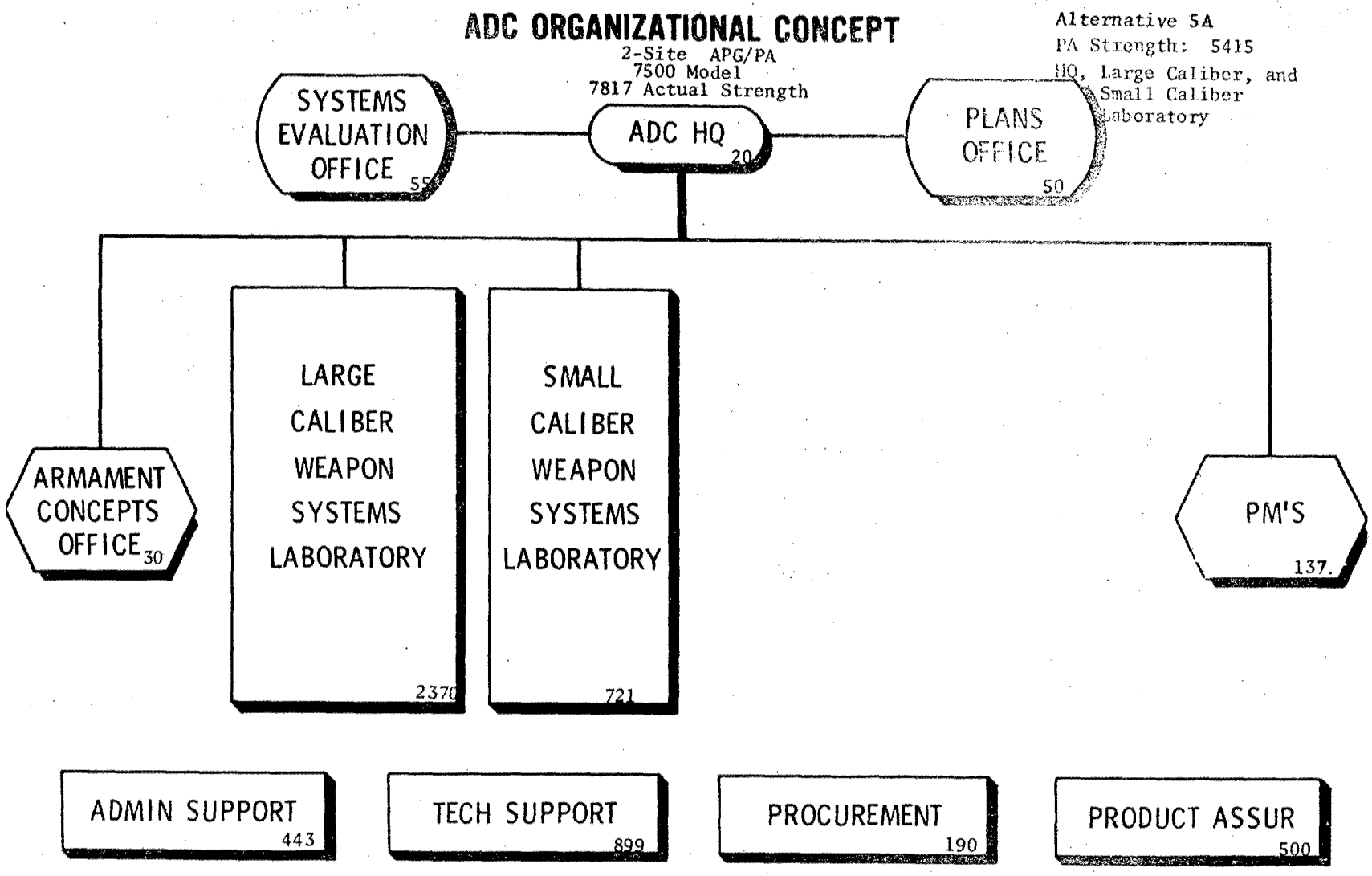

ADC ORGANIZATIONAL CONCEPT
2-Site APG/PA
7500 Model
7817 Actual Strength
Alternative 5A
PA Strength: 5415
HQ, Large Caliber, and Small Caliber Laboratory
SYSTEMS EVALUATION OFFICE 55
ADC HQ 20
PLANS OFFICE 50
ARMAMENT CONCEPTS OFFICE 30
LARGE CALIBER WEAPON SYSTEMS LABORATORY 2370
SMALL CALIBER WEAPON SYSTEMS LABORATORY 721
PM'S 137
ADMIN SUPPORT 443
TECH SUPPORT 899
PROCUREMENT 190
PRODUCT ASSUR 500

Figure II-G-7

ADC ORGANIZATIONAL CONCEPT

2-Site APG/PA
7500 Model
7996 Actual Strength

Alternative 5B
PA Strength: 3364
Large & Small Caliber Laboratories, Munitions Divisions

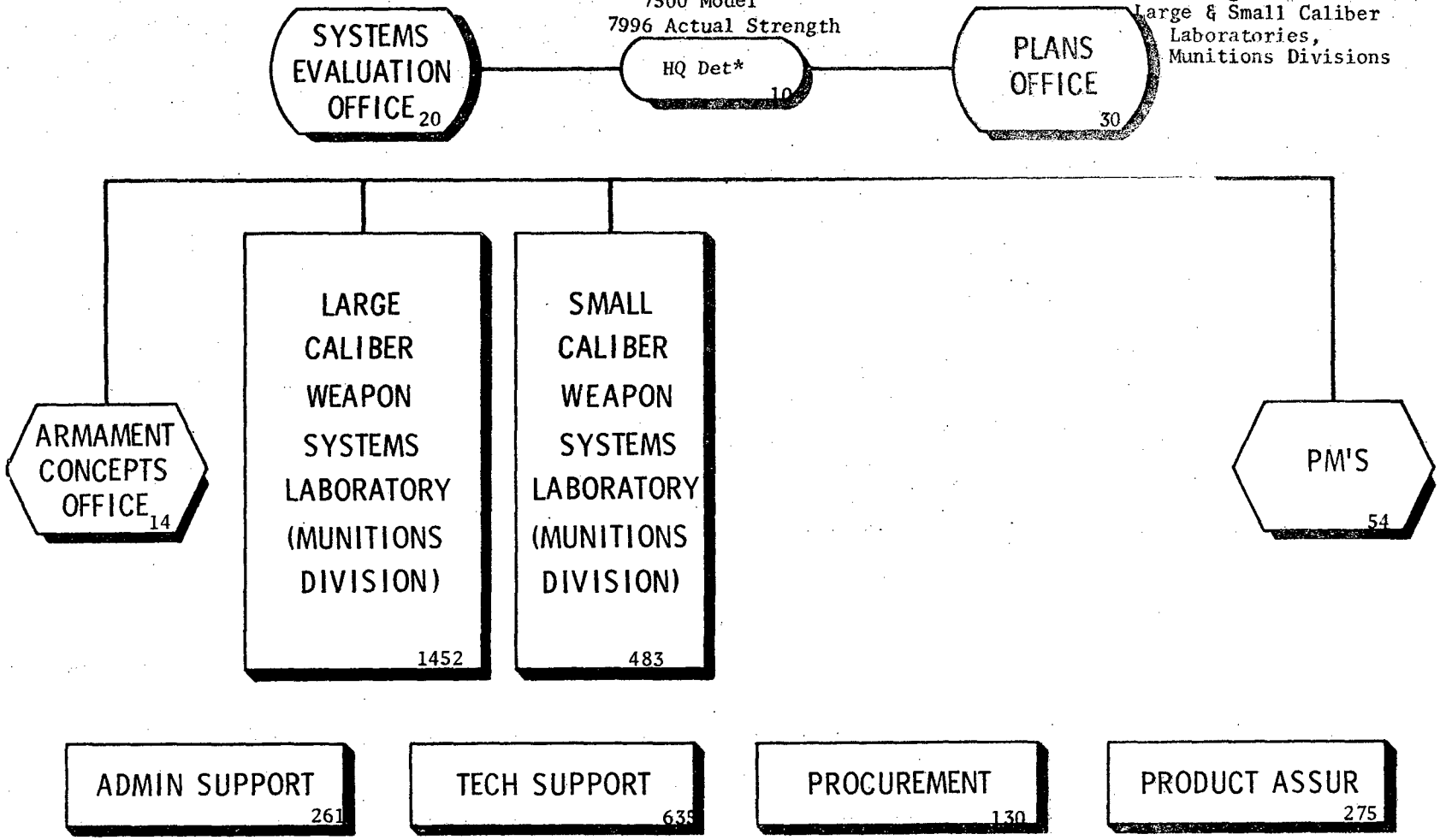


Figure II-G-8

* Headquarters Detachment

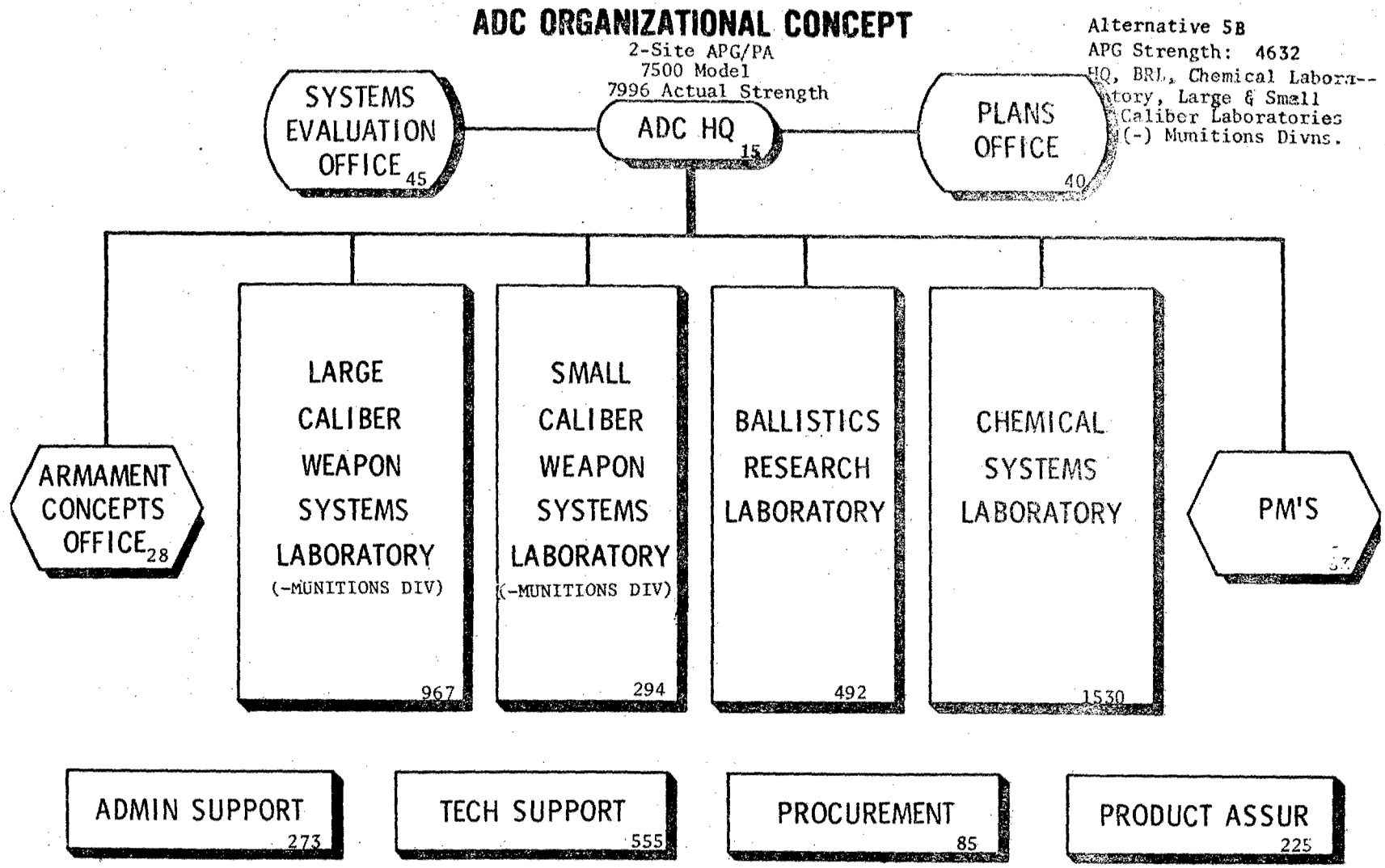

ADC ORGANIZATIONAL CONCEPT
2-Site APG/PA
7500 Model
7996 Actual Strength
Alternative 5B
APG Strength: 4632
HQ, BRL, Chemical Labora--
tory, Large & Small
Caliber Laboratories
(-) Munitions Divns.
SYSTEMS EVALUATION OFFICE 45
ADC HQ 15
PLANS OFFICE 40
ARMAMENT CONCEPTS OFFICE 28
LARGE CALIBER WEAPON SYSTEMS LABORATORY (-MUNITIONS DIV) 967
SMALL CALIBER WEAPON SYSTEMS LABORATORY (-MUNITIONS DIV) 294
BALLISTICS RESEARCH LABORATORY 492
CHEMICAL SYSTEMS LABORATORY 1530
PM'S 57
ADMIN SUPPORT 273
TECH SUPPORT 555
PROCUREMENT 85
PRODUCT ASSUR 225

Figure II-G-9

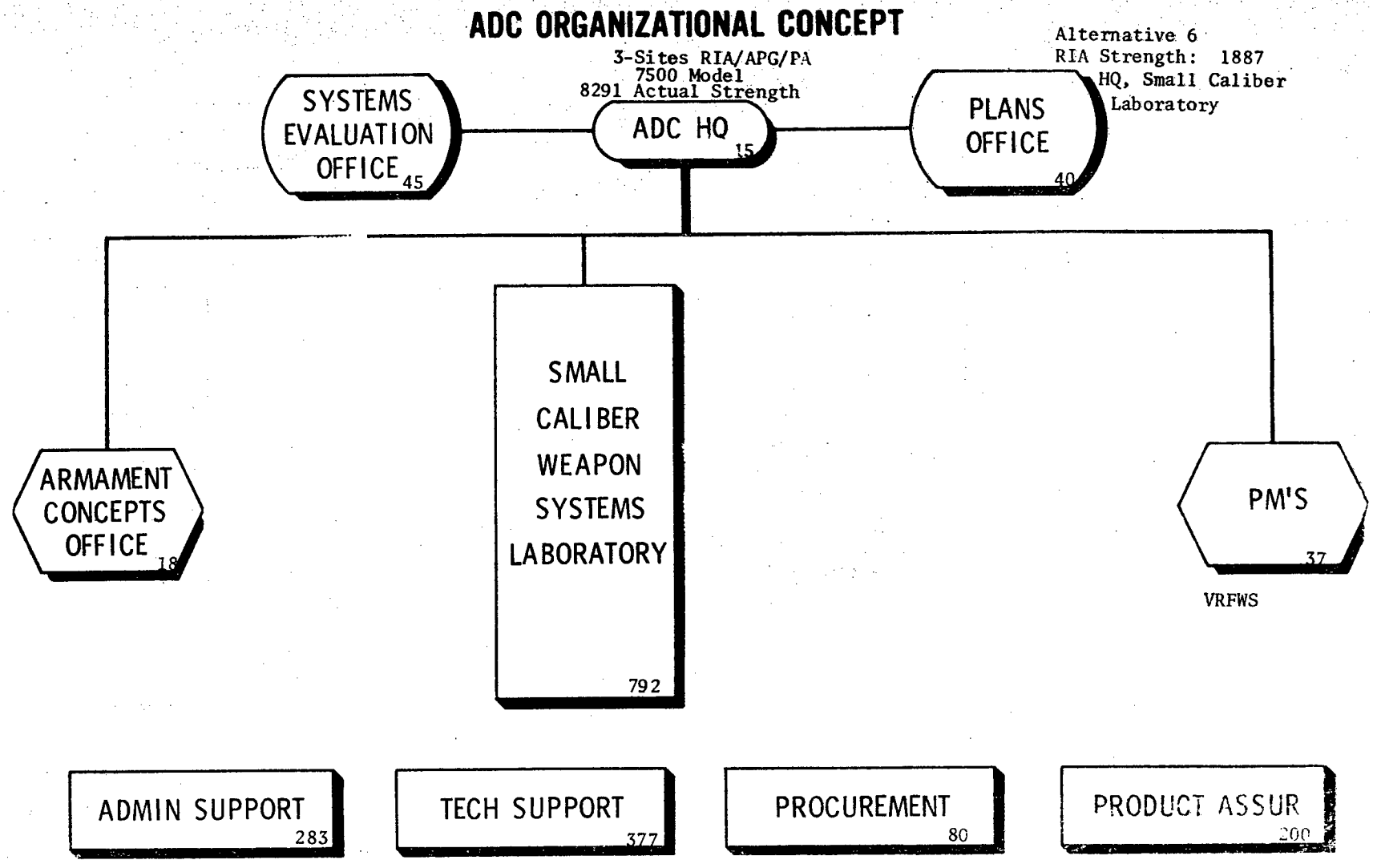
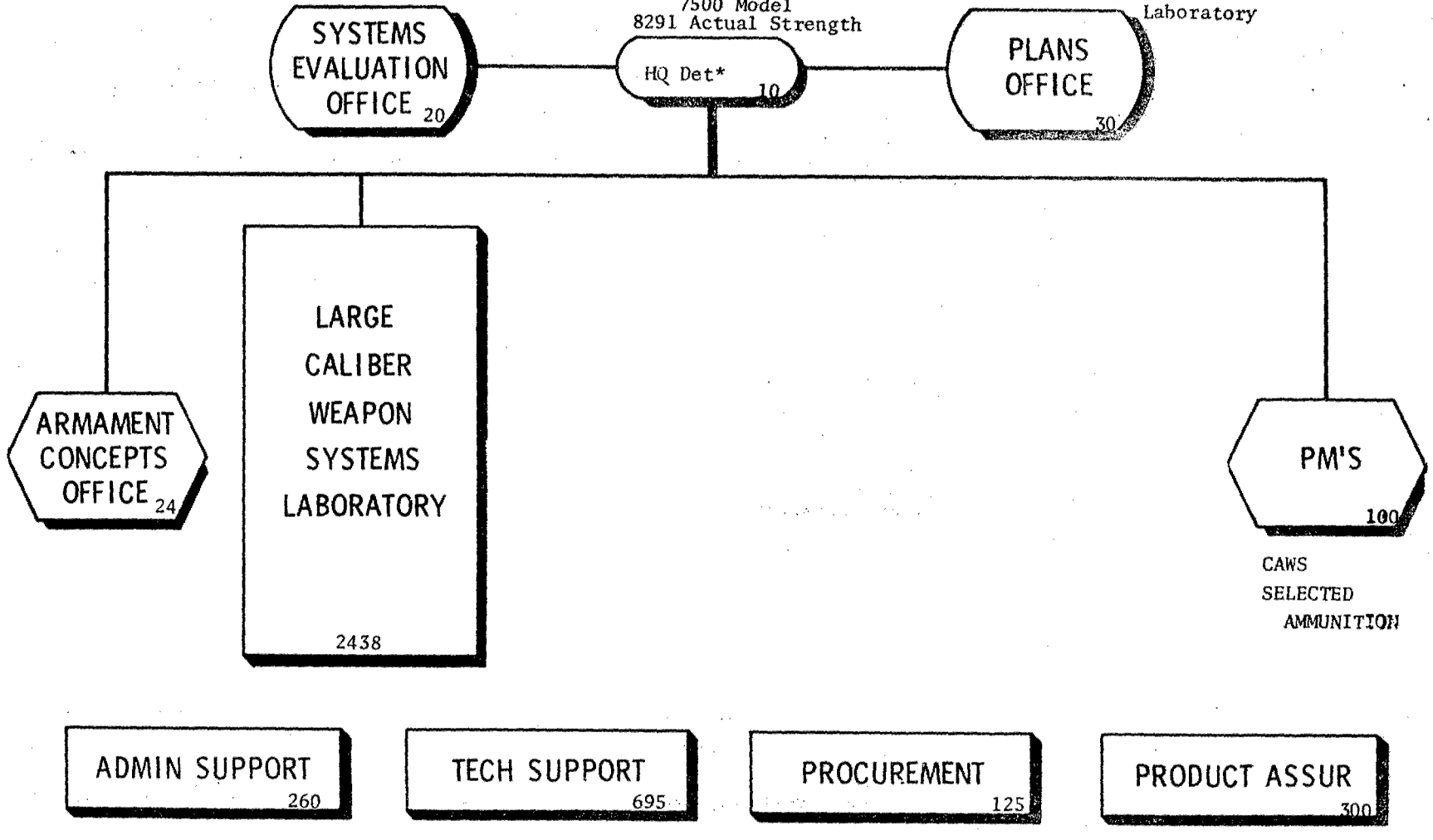


Figure II-G-10

ADC ORGANIZATIONAL CONCEPT

3-Sites RIA/APG/PA
7500 Model
8291 Actual Strength

Alternative 6
PA Strength: 4002
Large Caliber
Laboratory



* Headquarters Detachment

Figure II-G-11

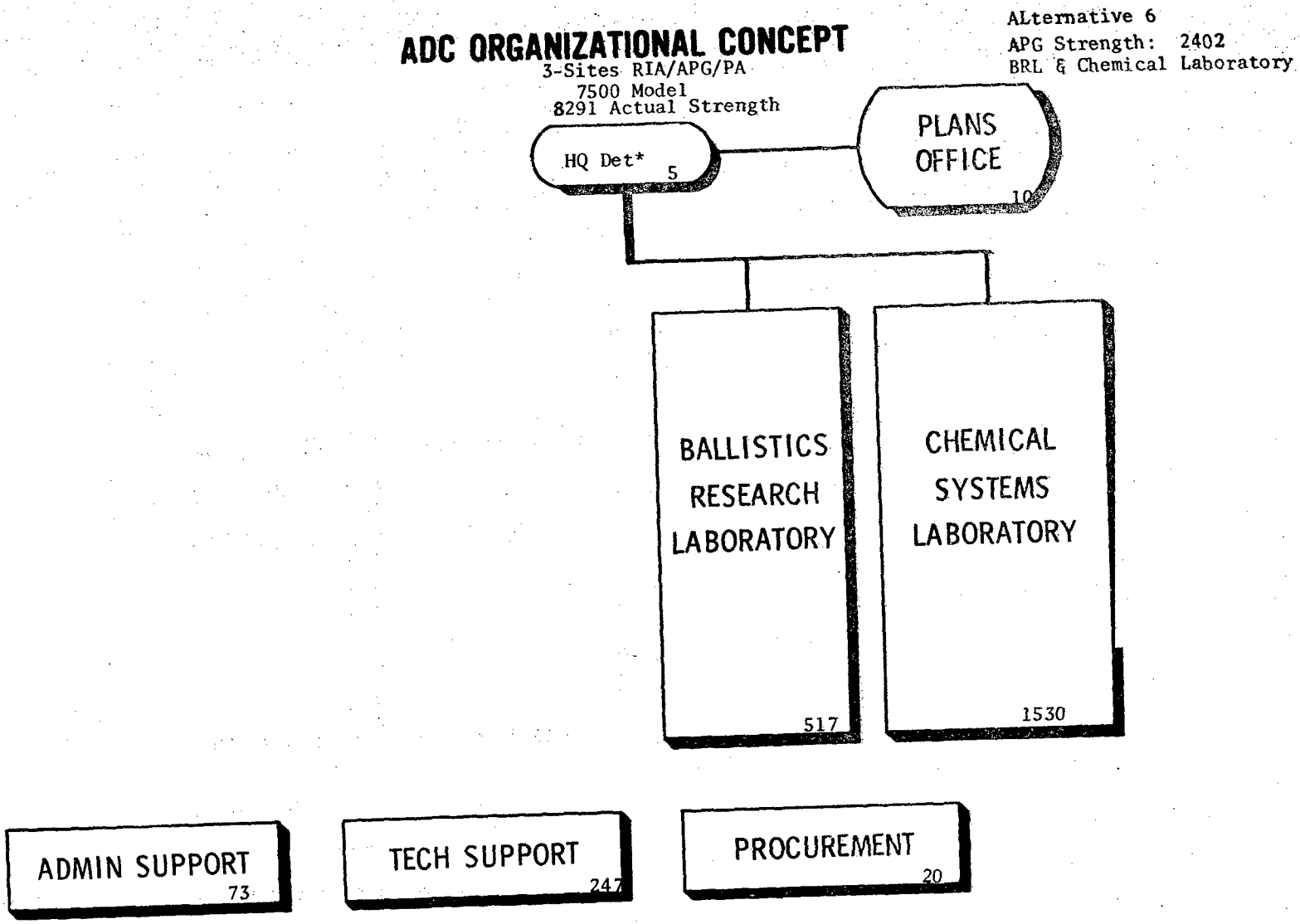


Figure II-G-12

*Headquarters Detachment

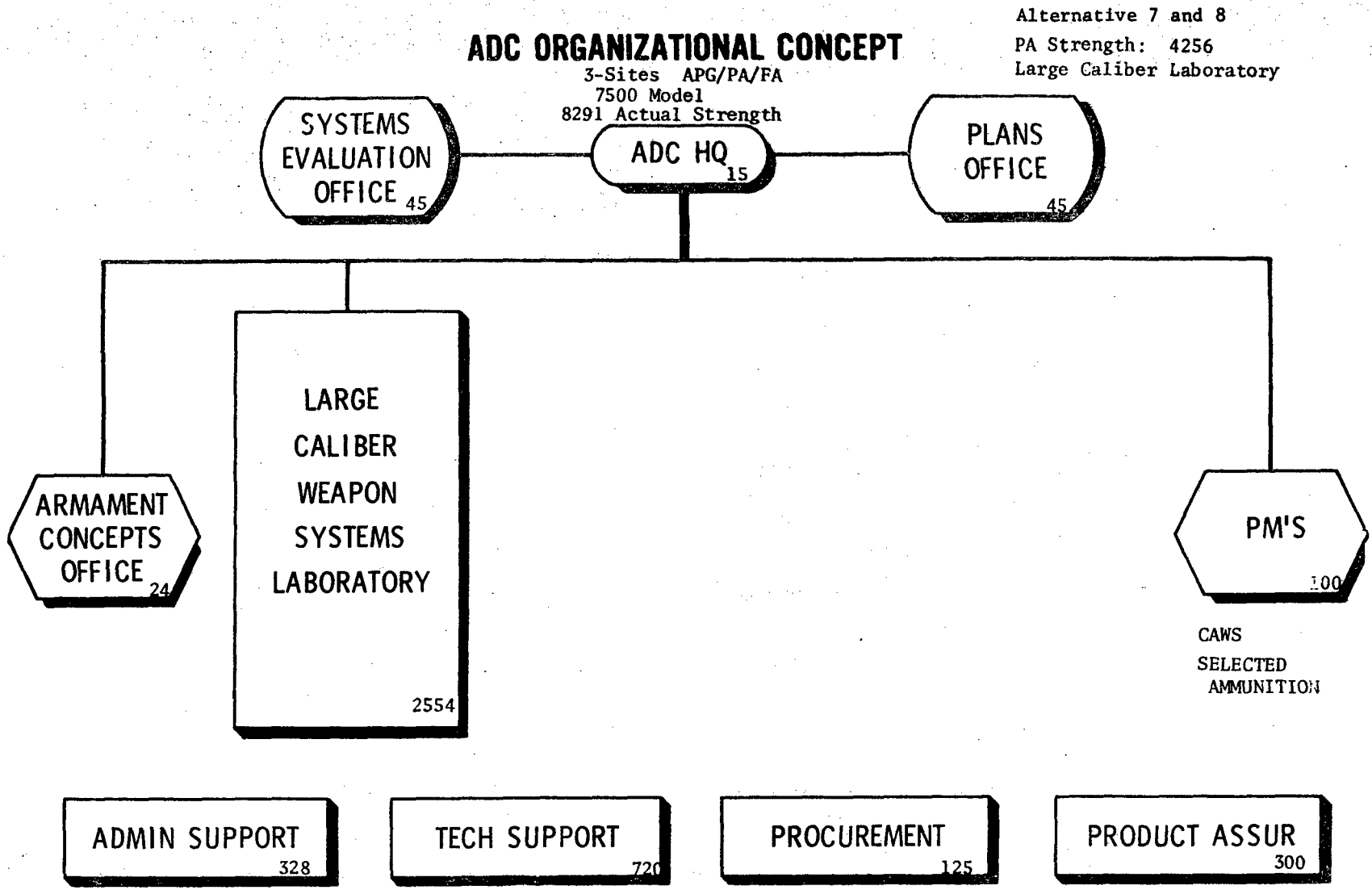
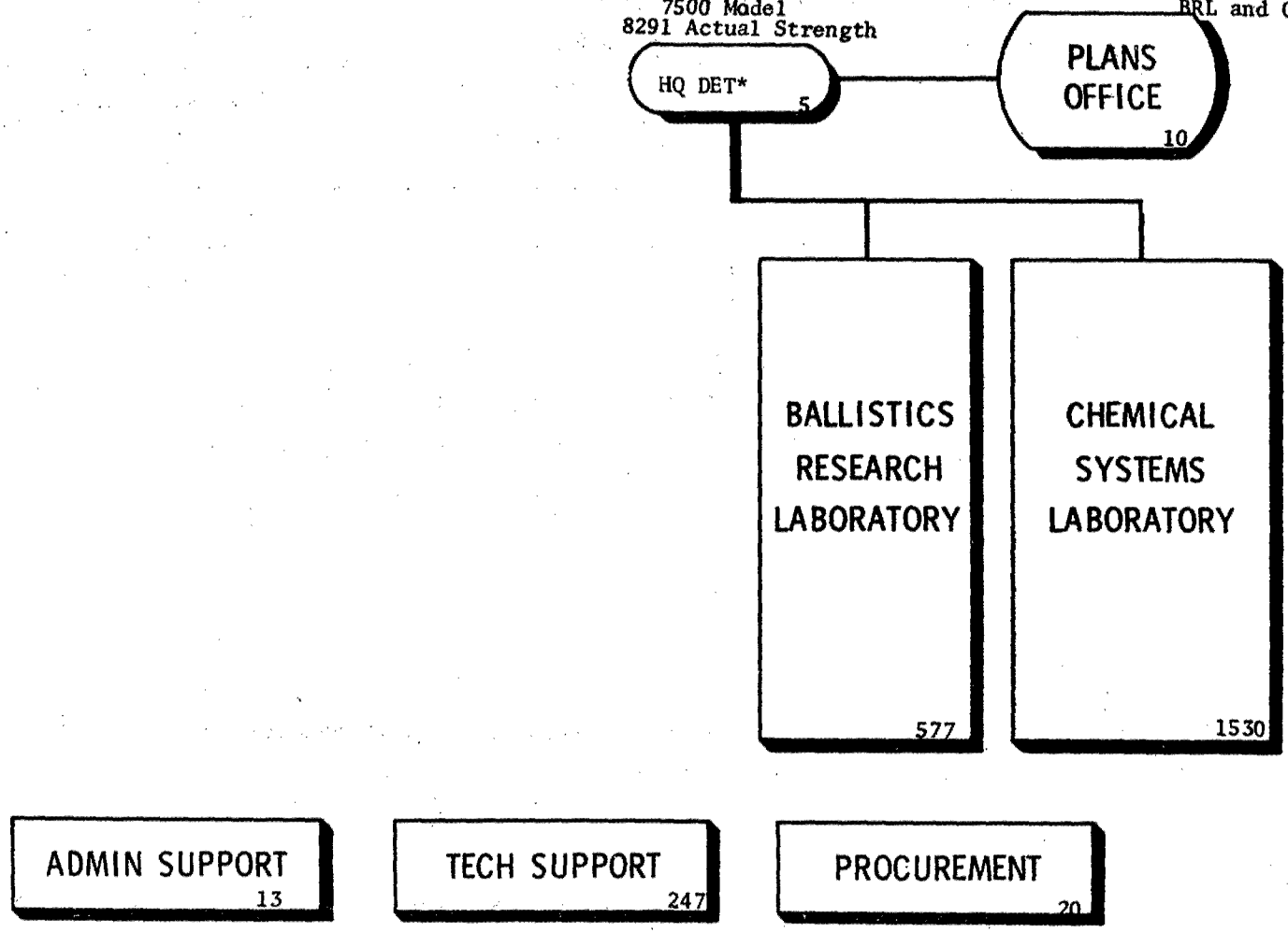


Figure II-G-13

ADC ORGANIZATIONAL CONCEPT

3-Sites APG/PA/FA
7500 Model
8291 Actual Strength

Alternative 7 and 8
APG Strength: 2402
BRL and Chemical Laboratory

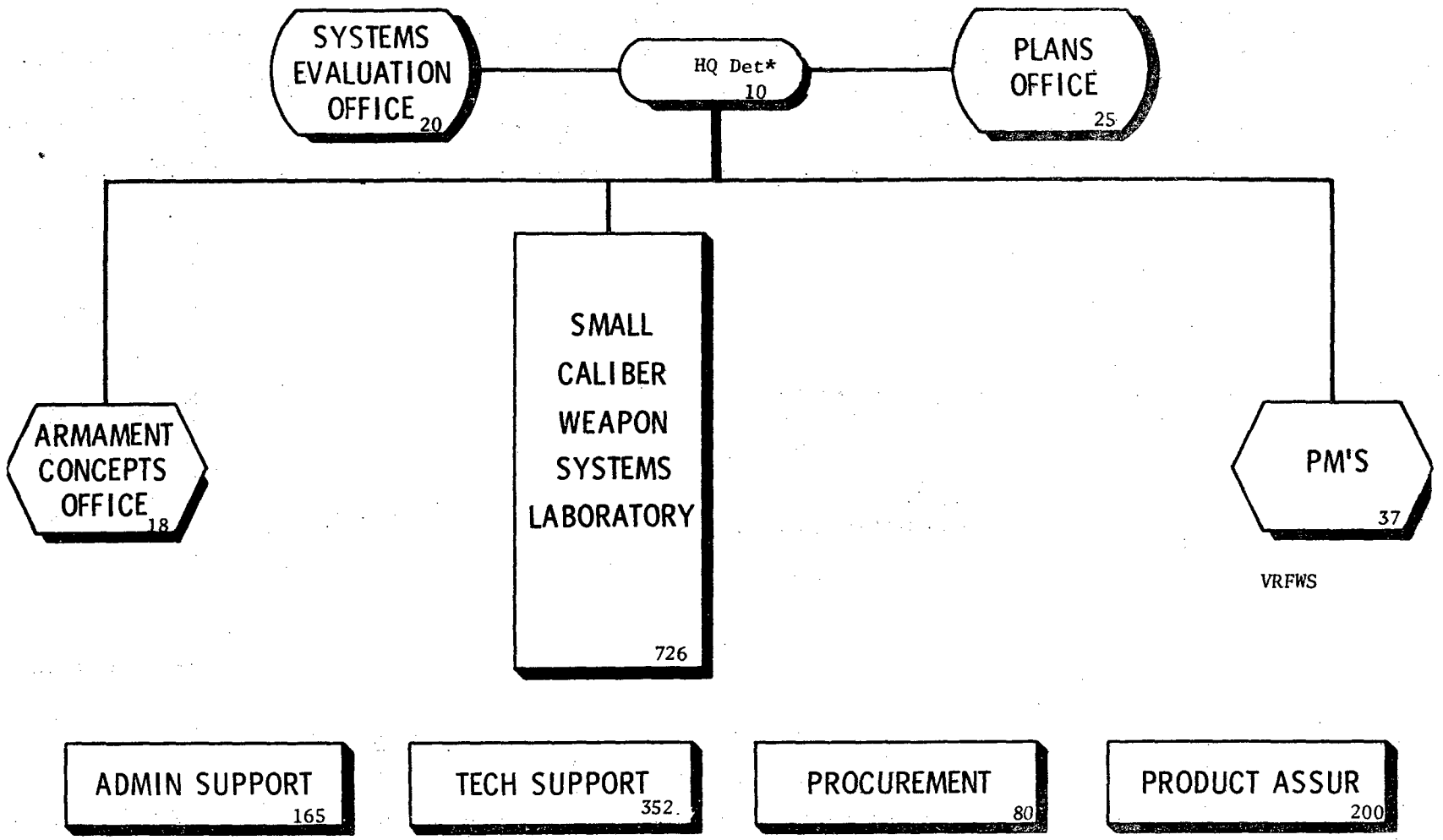


*Headquarters Detachment

Figure II-G-14

Alternative 7 and 8
Frankford Strength: 1633
Small Caliber Laboratory

ADC ORGANIZATIONAL CONCEPT



*Headquarters Detachment

Figure II-G-15

Alternative 7 and 8
PA Strength: 4256
Large Caliber Laboratory

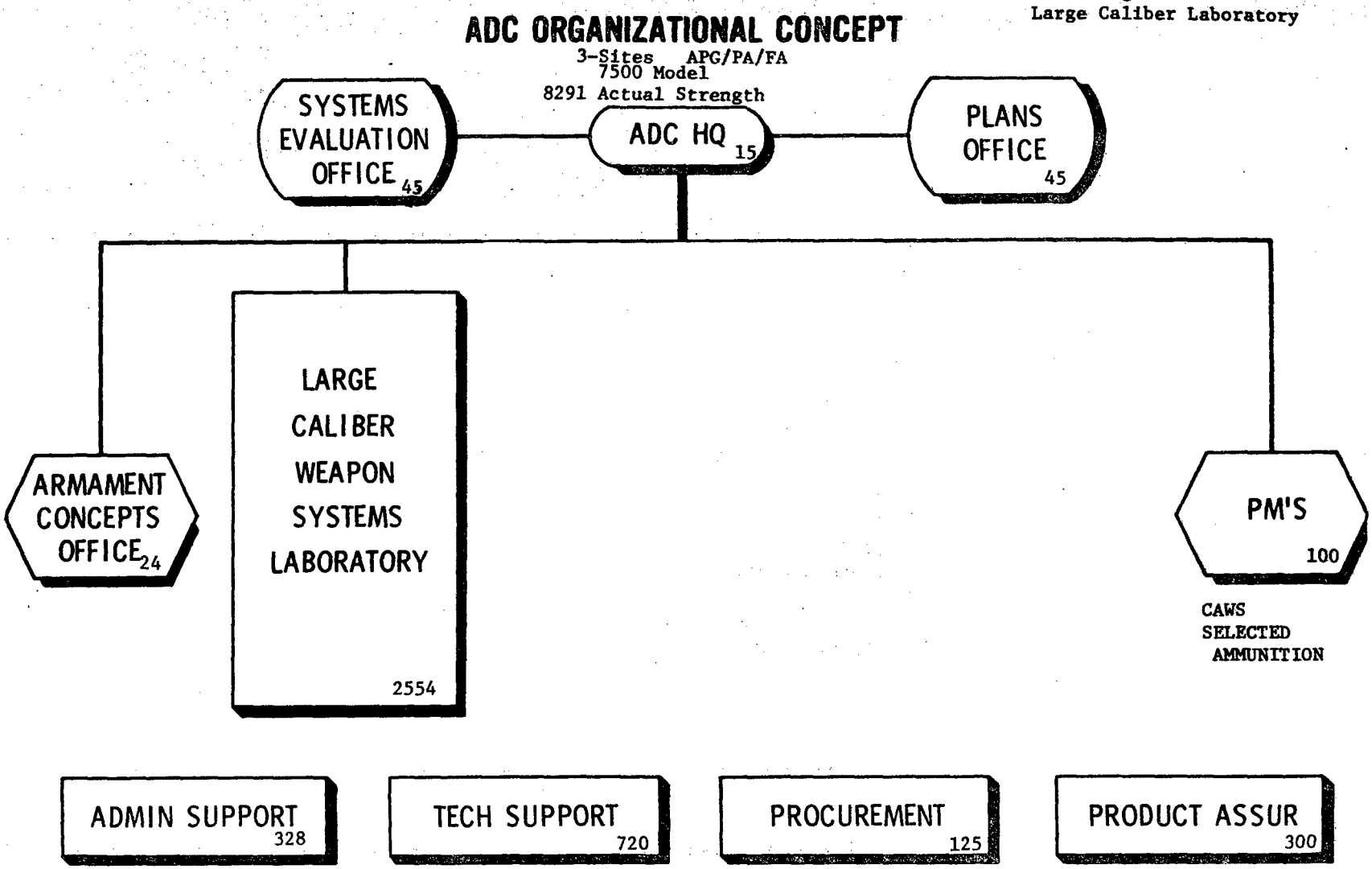


Figure II-G-16

ANNEX II-H

CONCEPT ISSUES

ANNEX II-H

CONCEPT ISSUES

During the development of the ADC study, several issues were developed which required resolution before the concept could be completed. In the main these issues have been resolved, however, they are listed below for historical record. Where merited, a complete discussion of advantages and disadvantages is shown, otherwise only the issue and the subsequent discussion and/or resolution is included.

1. Should the Edgewood CB activity be incorporated into the ADC?

2. What is the best disposition of the current BRL vulnerability/survivability mission and capability which serves more than the armament community?

3. What is the best disposition of the current HDL electronic fuze mission and capability?

4. How extensive a technology base in fire control should be established at the ADC in view of capabilities in other AMC centers?

5. How should integrated logistics support (ILS) planning be handled?

6. Who should be responsible for the manufacturing methods and technology (MMT) program?

7. Should the ADC provide engineering support to production after transfer of procurement responsibility to the ADC?

8. Who should maintain the Technical Data Package (TDP)?

9. Should the ADC have its own Civilian Personnel Office (CPO)?

10. Should the ADC have a civilian or military head?

11. What is the role of combat arms officers in the ADC?

12. Should various mission areas of the ADC be contract (or GOCO)?

1. ISSUE: Should the Edgewood CB activity be incorporated into the ADC?

a. BACKGROUND. Edgewood Arsenal (EA) has the mission for the life cycle management of materiel associated with chemical warfare. This includes responsibility for offensive weapons, defensive systems, and medical response. In addition, Edgewood Arsenal has the mission for defense against biological weapons and certain other items including flame, smoke, riot control and incendiaries. There are several assigned objectives in the Research and Development (R&D) program: AMC has been assigned DoD responsibility for the search for chemical agents, the measurement of medical effects of chemical agents, and medical aspects of defense against chemical agents. In 1969, the President of the United States unilaterally renounced the use of bioligical warfare; thus, the EA biological program is confined solely to defensive measures. The extent of public and Congressional concern over chemical warfare (CW) led in 1970 to a Congressional requirement to report to them on the extent and nature of the program and constraints upon both program and logistics, such as prohibition on transportation, open air testing and disposal unless stringent requirements are met.

b. DISCUSSION. In view of the national concern, uniqueness of the program and centralization at one arsenal, the question has been raised regarding the management of this program under an Armament Development Center (ADC). In addition, primary emphasis is on defensive CB programs (as opposed to chemical offensive programs/munitions) which involve different technologies from those associated with ADC. Although proposals were advanced which would assign offensive chemical programs to ADC and defensive chemical/biological programs to some other command, these were rejected as fragmenting the overall CB mission. Consideration was given to transferring out of EA those non-related CB items (flame, smoke, and incendiaries) and those items related to the Surgeon General's area of medical treatment (prophylaxes and therapeutics).

c. ALTERNATIVES:

(1) Establish Edgewood Arsenal as a sub-R&D center of ADC with its own commander.

(2) Establish Edgewood Arsenal as an independent R&D Center (less flame, smoke, and incendiaries) reporting directly to AMC Headquarters.

(3) Establish Edgewood Arsenal as a sub-R&D center of ADC with its own commander, but transfer responsibilities and resources for flame, smoke, and incendiaries to other elements of ADC.

(4) Incorporate the Edgewood Arsenal into the ADC. Redesignate the arsenal as a subordinate chemical laboratory of the ADC. Transfer flame, smoke, and incendiaries to other elements of ADC.

Alternative	Advantages	Disadvantages
1	Activities may continue. Retains warhead/shell and chemical filler work together. Provides high level sponsor (ADC Cdr) for CB program.	Adds layer between EA and AMC Headquarters. Flame, smoke, and incendiaries detract from CB mission. Defensive CB aspects are not armament mission oriented.
2	Provides direct access to AMC Headquarters. Concentrates on chemical/biological activities.	Extends the span of control of AMC Headquarters. Removes high level sponsor from CB program. Separates the warhead/shell from the chemical filler.
3	Concentrates on chemical/biological activities. Retains warhead/shell and chemical filler work together. Provides high level sponsor (ADC Cdr) for CB program.	Adds layer between EA and AMC Headquarters. Defensive CB aspects are not armament mission oriented.
4	Provides general officer sponsor for CB activities.	Requires some reduction of force at EA. Downgrades visibility of EA as separate installation.

d. RESOLUTION. At several in-process reviews, the Commander, AMC, indicated a preference for Alternative 4. At one point, he directed that Edgewood functions be completely folded into similar functions in the ADC; however, this guidance was later modified to establish a separate Chemical Systems Laboratory within the ADC.

2. ISSUE: What is the best disposition of the current BRL vulnerability/survivability mission and capability which services more than the armament community?

a. BACKGROUND.

(1) BRL is currently the Lead Laboratory for Vulnerability Technology which encompasses the following:

(a) Vulnerability and vulnerability reduction primarily to ballistic effects (i.e., blast, bullets, fragments, KE penetrators, shaped charges) but also includes laser effects.

(b) Determining vulnerability of all materiel of interest to the Army as potential targets.

(c) Determining how our own systems can be made more survivable on the battlefield (vulnerability reduction).

(d) Advancing the state-of-the-art in vulnerability models, testing, techniques and methods.

(e) Conducting vulnerability assessments and providing vulnerability data for all users.

(f) Assisting the commodity commands in developing their own vulnerability analysis teams in order to address survivability of their own mission materiel.

b. DISCUSSION.

(1) Vulnerability data against potential enemy targets are essential for design and development of warheads and weapons. Vulnerability assessment techniques are needed to determine the lethality of munitions and warheads. Vulnerability data against both potential enemy targets and our own materiel are utilized by weapon system analysts as a vital input to studies. Vulnerability assessments are critical to increasing the battlefield survivability of our materiel.

(2) Each commodity command or development center should have its own vulnerability assessment capability to be able to incorporate survivability into its materiel where appropriate and practicable. Some commands have developed a capability; others have not.

(3) Experience has demonstrated that there should be standardization of vulnerability data regarding targets whether the data are required by ADC, MICOM, AVSCOM or TACOM weapon systems, e.g., a tank target should be the same no matter who is looking at it. There has been a beneficial synergistic effect in the development of description of materiel; vulnerability assessment techniques, methods and procedures; and the production of vulnerability data under the lead agency.

(4) Currently, BRL is involved in coordinating and maintaining standardization in vulnerability assessment on a joint service basis under the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME).

(5) It has been estimated by BRL that, based on their current resources, approximately two thirds of their effort is devoted to determining vulnerability of targets and lethality of our munitions. Approximately one third of their resources is directed toward vulnerability assessment applicable to survivability for other than ADC.

(6) Currently, the Vulnerability Laboratory, BRL, derives support from its sister laboratory, Terminal Ballistics Laboratory, which develops fundamental data on the reaction of materiels to impact. These data are needed to predict the penetration of various KE mechanisms into various materiels as a function of mass, size and velocity.

(7) Testing is an essential aspect of vulnerability analysis. Currently, the Vulnerability Laboratory has facilities to test various materiel under simulated realistic conditions at APG. In addition, the vulnerability analysis capability is dependent upon use of computers for target descriptions and vulnerability assessments.

c. ALTERNATIVES.

(1) BRL prefers that the mission be assigned to ADC, and AMSAA had indicated that this could be done.

(2) AMSAA prefers the mission and Vulnerability Laboratory be assigned to them to provide a completely independent organization available to assist all development centers.

(3) AMSAA also suggests, as another alternative, that they be provided with a vulnerability and survivability capability while delegating the vulnerability test and data acquisition portion of the program to ADC or TECOM.

(4) Another alternative would be to have an independent agency reporting directly to AMC Headquarters or to a "neutral" center such as the Washington Area Development Center.

Alternative	Advantages	Disadvantages
1	Output feeds directly into ADC needs.	ADC demands may override other customer needs.

Alternative	Advantages	Disadvantages
	Retains current capability and technology base if it stays in place. Retains present standardization, uniformity, synergistic benefits and economy.	May lose some objectivity and independent analysis.
2	Retains current independent and objectivity analysis. Retains current capability and technology base. Retains present standardization, uniformity, synergistic benefits, and economy.	AMSAA demands may override other customer needs. Some duplication of capability will be needed at ADC.
3		Fragments integral and synergistic activity Puts AMSAA in position of trying to workload ADC or TECOM.
4	Retains current independent and objectivity analysis. Retains present standardization, uniformity.	May lose some expertise if moved. Some duplication of capability will be needed at ADC.

d. CONCLUSION.

(1) The current vulnerability/survivability capability of the BRL should not be fragmented but retained as an integrated mission to serve all users, for overall economy, standardization, and synergistic benefits.

(2) All development centers should continue to enhance their own vulnerability assessment capability with assistance and coordination of lead agency.

(3) The ADC is one of the principal users of vulnerability data.

(4) The mission can be incorporated into ADC or another agency effectively and serve all needs with proper responsibility, resources, and management emphasis.

e. RESOLUTION. A letter, dated 8 October 1974, from Deputy Commander, AMC, designated the Army Material Systems Analysis Agency (AMSAA) as the lead laboratory for survivability. BRL will retain a vulnerability/lethality laboratory.

3. ISSUE: What is the best disposition of the current HDL electronic fuze mission and capability?

a. BACKGROUND.

(1) AMARC recommended that a Combat Support Development Center evolve in the Washington area by assigning HDL additional missions of combat surveillance and target acquisition (CSTA) and consolidating with others (NVL, MERDC, and possibly HDL).

(2) Currently a major part of HDL's mission pertains to electronic fuzes, including proximity fuzes, radiating or influence fuzes, electronic time fuzes, and selected command fuzes. In addition, they are Lead Laboratory for fluidic technology which is applicable to fuzing. They have a considerable degree of expertise in electronics and fluidics which is recognized and judged to be very good. In support of armament system managers they develop electronic fuzes including the conduct of industrial and maintenance engineering, related prototype production, and, in some cases, the actual PEMA procurement.

b. DISCUSSION.

(1) There is an overwhelming consensus, within the armament and other communities, that materiel should be developed on an integrated systems basis, and the developer should be responsible for all dedicated components or sub-systems of a total system. He should determine where the work is accomplished and how he spends his funds, including technology funds related to his systems. The technology communities throughout the AMC field agencies, such as HDL in electronic fuzing, MICOM in guidance and control, and Picatinny Arsenal for warheads, should be proficient enough to attract weapon system developers to do business with them.

(2) The HDL is moving into new facilities on the grounds of Naval Ordnance Laboratory (NOL), White Oak. At the same time the Navy is contemplating the transfer of their NOL, White Oak, facility to the Naval Weapons Laboratories, Dahlgren, Virginia. In light of the above, DDR&E is consolidating all Services' electronic fuze responsibility under the Army at White Oak.

(3) It is highly desirable to retain the Army's current electronic fuze technology and capability. At the same time, the electronic fuze technology is very similar to that required for Combat Surveillance, Target Acquisition (CSTA) which would be HDL's principal mission under the Washington Area Development Center (WADC). There are some who feel that in time the CSTA mission will detract from the fuze mission and the latter may suffer.

c. ALTERNATIVES.

(1) Consolidate all FA and PA fuze work at ADC, MICOM, and ADC; control funds for fuze program at HDL (WADC).

(2) Consolidate all fuze work from HDL, FA, and PA at ADC.

(3) ADC take control of HDL fuze work force as Class II activity in place.

(4) Break HDL fuze effort at 6.3a; develop fuzes at ADC.

(5) Continue to use HDL as in the past.

Alternative	Advantages	Disadvantages
(1)	Retains system control	CSTA effort may detract from fuze effort
	Retains and uses fuze technology and capability.	Separates some warhead and fuze efforts.
	Consolidates impact and MT fuze efforts.	HDL fuze effort depends on decisions and funding from elsewhere.
(2)	Consolidates all fuze efforts.	Removes electronic technology needed for CSTA if most fuze people leave.
	Retain systems control Brings all warhead and fuze effort together.	Degrades technology until it can be rebuilt.
	Expertise immediately available for CSTA if most personnel remain at WADC.	New construction for fuze effort (NOL/WO) may be for naught.

Alternative	Advantages	Disadvantages
(3)	Suitable if Army assigned all fuze effort for DoD Retains systems control.	Separates some warhead fuze efforts Expertise for CSTA not available from HDL fuze personnel
(4)	Retains fuze technology.	Separates technology from development. CSTA effort may detract from fuze effort.

d. RESOLUTION. Alternative 5; Continue to use HDL (WADC) as in the past. Be prepared to accommodate total concentration of HDL on CSTA mission; if future experience indicates such a need, phase out fuze effort from HDL and build up electronic fuze capability at a comparable rate within ADC.

4. ISSUE: How extensive a technology base in fire control should be established at the ADC in view of capabilities in other AMC centers (particularly in the Washington area)?

a. BACKGROUND. Traditionally, fire control has been part of the weapon system with its technology base primarily in the field of optics. This expertise, which has been located at Frankford Arsenal, includes not only geometric and physical optics, but optical films; image evaluation and pattern recognition; radioactive illumination; stabilization (inertial and scene); laser resonators and receivers; infrared detectors and detector arrays; scan converters (IR, electro-optical, microwave); microwave transmitters, receivers, and radiometers; analogue, digital, and hybrid computers; computer programming; transducers; exterior ballistics; systems synthesis and analysis; vibration analysis and attenuation; and servomechanisms. Within AMC, other centers of expertise have since developed in the technical areas of sensors, radar, light magnification, infrared, lasers, visionics, and computers as well as fundamental research in the field of electronics and solid state physics. Industry also has a very large base, broadly diversified and extremely capable, in basic and applied electronics.

b. DISCUSSION. In any of the alternatives that are considered, the responsibility and 6.3, 6.4 and 6.7 funds for fire control systems will reside with the ADC. The broad area of data acquisition, data processing, and communications serving several weapons commonly will remain with the proposed Washington Area Development Center (WADC). However, that part of the target data acquisition and processing system that is tied in with the real time response of the weapon is considered part of fire control.

A very persuasive argument to have a strong technology base in fire control within the ADC is that fire control is an important and integral part of the weapon system. It can be expected that the trend to make weapons and projectiles more accurate will continue with the major advances being made in ordnance electronics. In order for the ADC to act as an intelligent buyer of fire control sub-systems it will be necessary to have its own strong base which can be at the forefront of this rapidly advancing technology.

On the other hand, with strong centers in electronics already in the WADC and industry, there is a question as to the need for building duplicative basic technology capabilities at the ADC.

c. ALTERNATIVES.

(1) Build up the technology base in fire control at the ADC as presently constituted at Frankford Arsenal.

(2) Build up the technology base in stabilization, exterior ballistics, systems synthesis and analysis, vibration analysis and attenuation, applied technology, computers, and servomechanisms at the ADC. Secure areas of technology base related to electro-optics, radar, and lasers from the other AMC centers of expertise, but possess the expertise to design and develop new fire control systems incorporating state of the art electro-optics, radar and lasers.

Alternative	Advantages	Disadvantages
1	Unites the technology base with the systems responsibility in a rapidly advancing field.	Builds some redundant technology in AMC which could dilute funds to advance technology.
2	Provides sufficient technology base for ADC to be a capable designer and intelligent buyer. Provides overall economy to AMC lab system.	Does not provide full, collocated technology base for fire control.

d. RESOLUTION. In order to allow ADC to be an intelligent buyer and yet not try to duplicate the strong electronics technology base at WADC, alternative 2 was selected.

5. ISSUE: How should integrated logistic support (ILS) planning be handled?

Although this area is a prime concern of the Armament Logistic Command, the process must begin early at the ADC. The ADC should have a small

organic cadre of ILS experts to insure, for the ADC, that such planning does occur and that it has an appropriate influence on the design. In addition, the Armament Logistic Command should have an ILS contingent at the ADC to insure proper planning; this contingent could be augmented on a temporary basis for specific development projects as necessary.

5. ISSUE: Who should be responsible for the Manufacturing Methods and Technology (MMT) program?

a. BACKGROUND.

(1) The MMT program is a part of the production engineering element of the overall production base support program. It is funded by PEMA dollars to assure that proven processes are available to produce new materiel and to improve processes to produce current materiel more economically. In FY76, the MMT program is approximately $39 million related to armament of which $35 million is ammunition.

(2) Within the current armament community, the MMT program is integrally woven into the design, development and production aspects of the life cycle without any clear separation between acquisition and readiness. AMARC recommended separating the management of acquisition from readiness to provide more intensive management over the developmental cycle. Hence, the issue arises as to who should be responsible for the MMT program in developing an ADC concept.

b. DISCUSSION.

(1) In the ammunition area the PM for munitions production base modernization and expansion (PM-PBM) is involved with MMT program. Of the $35 million FY76 budget for ammunition production base support, the PM is the proponent for a major portion of the MMT program.

(2) The PM-PBM has suggested that the establishment of a technical support command, as an agency under his control, be considered for the munitions production modernization and expansion program.

(3) Currently the MMT program is under the responsibility of the R&D community and included early in the development portion of the life cycle. The principal reason for this timing is that unless MMT is integrated and accomplished early in the development cycle, it is usually extremely costly to redesign the product or the process to be compatible and economical after production has begun.

c. ALTERNATIVES.

(1) ADC be assigned responsibility for the MMT program.

(2) ADC be assigned responsibility for the weapon related MMT program and the PB-PBM for the ammunition portion of the program.

(3) ALC be assigned responsibility for the MMT program.

(4) ADC and ALC split MMT program at a point in the acquisition cycle.

Alternative	Advantages	Disadvantages
1	Compatible with life cycle management. Maintains integral tie-in with development. MMT personnel maintain best working knowledge of product. Best overall economy of workforce.	ALC has to task ADC to provide improved, more economical processes. PM-PBM does not organically control MMT personnel.
2	Provides intensified management for ammunition MMT.	Separates responsibility for armament MMT program. Creates duplicative engineering staff if new agency is formed for PM-PBM.
3	ALC would control MMT for making economical improvement to process.	Fragments management responsibility between product and process. Potential problems with product changing as ALC changes the process. PM-PBM does not organically control MMT personnel.
4	Maintains integral tie-in with development. ALC controls MMT for process economies.	Fragments management responsibility between product and process.

d. RESOLUTION. It was resolved at meetings of the field

representatives, and later approved at an IPR that the MMT program would be split. The ADC will control MMT efforts which get the product into production or insure that new technologies are producible. The ALC will control MMT efforts which improve the manufacturing process to effect economies or efficiencies.

7. ISSUE: Should the ADC provide engineering support to production after transfer of procurement responsibility to the ALC?

a. DISCUSSION. The issue is whether engineering in support of production will be furnished to the ALC by the ADC after transfer of acquisition responsibility, or whether the ALC will develop an independent engineering capability to support production. There is concern from the ADC view that providing all engineering support of production to the ALC will dilute and detract from the emphasis desired on development; yet there is also ADC concern that, if they do not provide such support, the "feed back" of problems experienced in production may be lost or diminished and not be applied to new designs. The consultants expressed concern that we not build duplicative engineering staffs at the ALC and ADC. They recognized some diversion of effort from development would result but thought the ADC should accept the mission of life cycle engineering support to production (with the ALC caring for the simple day-to-day problems as is now the case, and with a small engineering staff left with those producing arsenals which may no longer have development activities collocated). The belief was expressed that the emphasis and management attention on development in the proposed ADC would still reverse the current situation. One consultant proposed that the ALC contract annually with the ADC for the man-years of engineering support to be provided, which would assist planning and keep attention to development orderly.

b. RESOLUTION. It was resolved that the ADC would provide ESP for initial production through the first buy. ESP in support of follow-on production would come from the ALC.

8. ISSUE: Who should maintain the Technical Data Package (TDP)?

a. DISCUSSION. Here the question is whether or not maintenance of the TDP is transferred when acquisition responsibility is transferred to the ALC. It is recognized that TDP maintenance is a time-consuming task, and yet the same concerns of not wanting to build duplicative engineering staffs at the ADC and ALC prevail. Further, there is deep concern in the munitions and cannon community that any changes made in a TDP be made by the ADC designers. Pursuing the same philosophy of economy of force of primary design expertise, the consensus of community views - although not unanimous favors the ADC retaining TDP maintenance for the life cycle. The proposed management of configuration control is discussed in the next chapter under concept of operation.

b. RESOLUTION. It was decided by the Commander, AMC, that maintenance of the TDP should remain with the ADC throughout the life cycle of the item.

9. ISSUE: Should the ADC have its own Civilian Personnel Office (CPO)?

RESOLUTION. Personnel staff advice has indicated that ADC would do well to be serviced by a non-dedicated CPO in order to forego the day-to-day problems of such operations. The ADC, in that view, could be adequately serviced by about four civilian personnel experts in the areas of job classification, recruitment, labor relations, and training and development (plus a supervisor) who would interface with and drive the CPO to serve the ADC. This approach is hotly contested by field commanders, including each of those visited who is served by a non-dedicated CPO; in the strongest terms, they and the consultants who served with AMARC recommend that the ADC have its own dedicated CPO even if it requires special exception to policy.

10. ISSUE: Should the ADC have a Civilian or Military head?

a. DISCUSSION. In this matter, the AMARC observed, "The Commanding Officer of a development center could be either military or civilian. The prime objective should be to obtain the best qualified manager. For civilian commanders of development centers, a limited term of service should be established with options for renewal." In establishment of the ADC, it is considered prudent to begin with a military commander to deal with the problems incident to the large complex undertaking; he will need very broad authority and the sustained support of the top civilian and military leaders in DoD as well as AMC and DA. When an appropriately qualified civilian is found to serve in the top management position, he should be selected on term appointment. Discussion with the Deputy ASA (R&D) revealed that he attributed the growing stature of BRL many years ago to the change from short term military commanders to a long term civilian director who could make long range commitments and insure their execution. A military officer, by necessity of star rank, to provide the necessary community attention and emphasis, should still be a part of such a civilian/military management team.

b. RESOLUTION. It was agreed to by consensus that the initial commander of the ADC should be a military flag-rank officer. After the establishment of the ADC, the commander, civilian or military, should be selected on a best qualified basis.

11. ISSUE: What is the role of combat arms officer in the ADC?

a. DISCUSSION. Recognizing a strong need to improve the interface between the development and user communities, the AMARC report proposed that combat arms officers, with experience, serve at the development centers. This proposed assignment of officers as consultants has become a controversial issue. Some argue that it is much easier to teach an officer qualified in the development field to understand and interpret the users' needs than to

teach the user what he would need to know of the development business. The Commander, TRADOC, has indicated he does not want TRADOC officers serving in a liaison role at the development center to provide the user input; nor does he intend to "tell AMC how to run its business." He commented on the difficulty of the interface but seemed to believe that the needed relationship between the user and developer can be achieved within the existing system. He expects good interaction at the worker level, and he plans to participate personally with his school commandants (Infantry, Armor, Artillery, etc.) on major decisions on important developments. Some who had experience with users integral to the development activities believe strongly that combat arms officers must be assigned to the ADC to make the interface work. The Navy has, for many years and with great success, assigned their equivalent of combat arms officers to development activities. The concept being formulated does find a need for a suitable mix of both technical and combat arms officers with the latter particularly essential in the areas of systems analysis, "Red Team" and marketing guidance for development of prototypes that demonstrate new or improved armament concepts.

b. RESOLUTION. It was decided that an increased number of combat arms officers should be assigned to the ADC. The reference organization envisioned a three-fold increase in their number.

12. ISSUE: Should various mission areas of the ADC be contract (or GOCO)?

a. GOVERNMENT-OWNED, CONTRACTOR-OPERATED (GOCO) OR CONTRACTOR OPERATIONS. The desirability of incorporating government-owned, contractor-operated (GOCO) or captive contractors for some of ADC's mission areas was discussed and analyzed extensively with field representatives, armament community personnel, consultants and others. Two extremes are possible: first, to do all work in-house, and second, to contract for management of all work which would be accomplished under GOCO arrangements or on contract; both extremes are judged unpalatable. The philosophy which emerged as a result of these deliberations is that ADC must have sufficient in-house capability and expertise in all aspects of armament to manage and develop materiel intelligently and to be a smart buyer. It must have and maintain a capability to communicate with other technology communities -- industry, other government agencies and academe. In order to do this, ADC will pursue sufficient in-house technology and developmental programs and contract for the balance. A good ratio of in-house to contractor work is judged to be about 50/50.

b. ADC will vigorously pursue those capabilities related to armament not available elsewhere and it will be challenged to induce greater participation by industry in both technology and developmental areas. In the armament business, there is little demand from the private sector for the materiel and technology being developed, except in the small arms field, which covers rifles, pistols and shot guns. The only customer is the defense establishment in this and other countries. Unlike the electronics and aerospace industries, where the capabilities can be marketed in both the private and military sectors, the challenge to ADC is to stimulate and retain a wider industrial base in armament than now exists.

c. Based on MICOM's experience with a captive contractor (Rohm and Hass for propellant chemistry work), the Director of the RD&E Laboratories expressed the view that he did not see a need for the Army to exploit any scientific field with a captive contractor. He was of the opinion that contractors should build their own competence to remain competitive with other industries. The Army should contract for specific capabilities and tasks available in industry. He felt that it was more difficult to reorient a captive contractor who is specialized than one's own in-house capability.

d. The development of nuclear adaption kits has been a topic of special attention from time to time by officials ot DDR&E and others. The question is whether nuclear adaption kits and related efforts should be GOCO or contract operation. Recent approaches call for competing, parallel proposals by both the Army (Picatinny Arsenal) and Sandia Corporation with a selection of a developer being made on the basis of the best proposal. The Army must assure that the evaluation is thorough and objective. Some or the advantages and disadvantages to changing from the current way of doing business to contract operations are listed below.

(1) Advantages.

(a) Reduces Army personnel spaces.

(b) Industry can provide expertise without program type funding and personnel constraints.

(c) Responds to previous DoD efforts to place nuclear weapon development responsibility with agency/contractor who can do best job based on competitive bids.

(d) Use of Sandia would facilitate the warhead/adaption kit development interface.

(2) Disadvantages.

(a) Reduces Army nuclear weapon technology base to point where there is no flexibility for rapid response to crash programs.

(b) May result in multiple agency interface contacts with warhead developer.

(c) Difficult to find contractor with warhead section/projectile/ADM development capability other than captive AEC labs.

(d) Even with contractor development, Picatinny must maintain strong maintenance engineering effort to take care of life cycle responsibilities.

(e) Picatinny must maintain product assurance capability.

(f) Single point of contact interface with warhead developer is lost.

(g) Logistical and user application and influence in final design effort may be lost.

(h) Not as responsive to design changes imposed by warhead developer during development.

(i) Not as responsive to MODS/ALTS required immediately after fielding or during deployment.

(k) Impairs rapid response and flexibility in technical publications and NMP/NICP functions as problems develop in field.

(l) May not reduce costs.

(m) Eliminates only Service in-house nuclear weapon engineering activity to be an intelligent buyer.

(n) Technical direction of contractor effort still required.

(o) Reduces ability to make rapid design changes as a result of problems found during development tests.

(p) Reduces technical base capability to respond to studies and efforts required in concepts, effectiveness, vulnerability, and safety.

e. After weighing the above, it was decided that the ADC should stay with the current way of doing business with careful and objective selection of the best competitive bid to fulfill the Army's requirements.

f. The area of technical support and computer operations appear to offer the most potential for continuing GOCO operations. Activities such as drafting, testing, and other areas in which the workload is subject to large fluctuations might be suitable for contract operations. When contract computer support was explored during field visits, the respondents were generally unconcerned whether or not it is contract operated as long as it is on the installation, and is dedicated and responsive to their needs. Determination to enter upon contract operations can best be made by the designated ADC command during the course of its establishment.

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This four-volume study responds to a DA requirement to study the recommendation of the Army Materiel Acquisition Review Committee (AMARC) regarding establishment of an Armament Development Center. The study concludes that such an organization should be created and proposes several feasible options. These are conceptual in nature; they are not detailed plans. Included is a substudy examining in concept the impact on the remainder of the Army's armament community.

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